



Ground-based harvest systems are designed for areas with slopes less than 35 percent.

# Timber Harvest

Harvesting timber is more complex than the act of cutting trees. Good planning will address many of the issues that need to be considered in your harvest plan, including: management objectives, site conditions, resource protection, harvest type, and economic factors. This section discusses the options available to you when planning your harvest.

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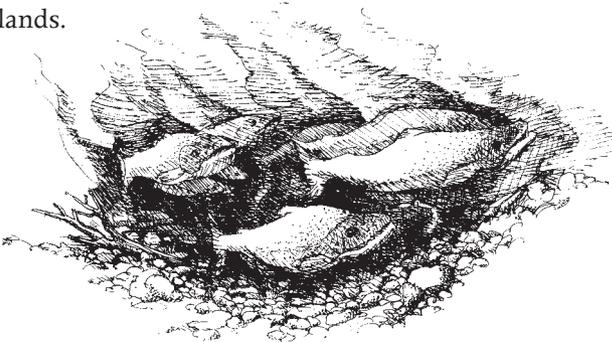
**APPLICABLE FOREST PRACTICES RULES**  
WAC 222-30 Timber Harvesting  
WAC 222-20-050 Classes of Forest Practices

# Riparian and Wetland Protection

**Riparian and wetland areas are important parts of the forest ecosystem that provide fish, amphibian, and wildlife habitat; preserve water quality; and help protect areas during flood and drought conditions. These unique and valuable areas are important for landowners to identify and protect.**

**W**et soils, high water tables, and the presence of water-tolerant plants commonly characterize wetland and riparian areas. Soils in these areas soak up water in the wet season and then slowly release it during drier periods. This helps regulate the water level during times of high water and seasonal low-flows. Trees, vegetation, and their root systems stabilize stream banks and capture sediment and other debris to prevent it from entering stream channels. The trees also provide shade to keep the water cool for healthy fish use.

Sediment entering streams can kill aquatic plants and insects that provide habitat and nutrients for fish. Sediment can also fill resting pools and gravel spawning beds that fish need for reproduction. During and after timber harvest, it is important that trees and vegetation remain to function as a buffer for streams and wetlands.



## What Do Stream and Wetland Buffers Do?

- ▶ Filter runoff to minimize sediment entering water
- ▶ Provide logs and organic material crucial for fish and amphibian habitat
- ▶ Maintain shade and regulate stream temperatures
- ▶ Provide wildlife habitat



COHO SALMON ILLUSTRATION BY JANE CHAVEY / DNR



Spirea (hardhack)



Pinegrass



Skunk cabbage



Labrador tea

### Trees and Plants Associated with Riparian and Wetland Areas

The following plants typically are found in riparian areas and wetlands; however, their presence does not always indicate the existence of a riparian area, Channel Migration Zone (CMZ) or a wetland. Contact the Washington State Department of Ecology for professional help with identifying wetlands.

#### TREE SPECIES

##### Eastern Washington

- Engelmann spruce
- Quaking aspen
- Sitka alder
- Black cottonwood

##### Western Washington

- Sitka alder
- Sitka spruce
- Western red cedar
- Oregon ash
- Red alder

#### PLANT SPECIES

##### Eastern and Western Washington

- Labrador tea
- Red osier dogwood
- Reed canary grass
- Rushes & sedges
- Willow
- Spirea (hardhack)
- Bog laurel
- Skunk cabbage
- Cattails

Riparian and wetland areas are important parts of the forest ecosystem that provide fish, amphibian, and wildlife habitat, preserve water quality, and help protect areas during flood and drought conditions.



#### Turbidity Level

Turbidity is the level of sediment in water. As turbidity increases, the amount of oxygen decreases, affecting fish and plant life.



Sediment entering streams can harm aquatic plants and insects that provide habitat and nutrients for fish. Sediment can also fill resting pools and gravel spawning beds that fish need for reproduction.

Buffers filter sediment; provide shade, bank stability, and cool, clean water for fish to use as habitat.



NON-FISH  
HABITAT  
STREAM  
TYPE 'Np'

FISH  
HABITAT  
STREAM  
TYPE 'F'





### Channel Migration Zone (CMZ)

In some cases, part of the Riparian Management Zone (RMZ) could be a Channel Migration Zone (CMZ). The CMZ is an area of the stream where the channel is prone to move. Over time, when a stream channel moves, the buffers needed to protect the stream will move with it.

For more information and guidance on determining the presence of a CMZ, please see **Board Manual Section 2.**



**During and after timber harvest, it's important that trees and vegetation remain to function as a buffer for streams and wetlands.**

**Riparian and wetland buffers are grouped into two categories:**

- ▶ Riparian Management Zones (RMZs) and
- ▶ Wetland Management Zones (WMZs)

# A Closer Look at Riparian Management Zones

## Unstable Slope

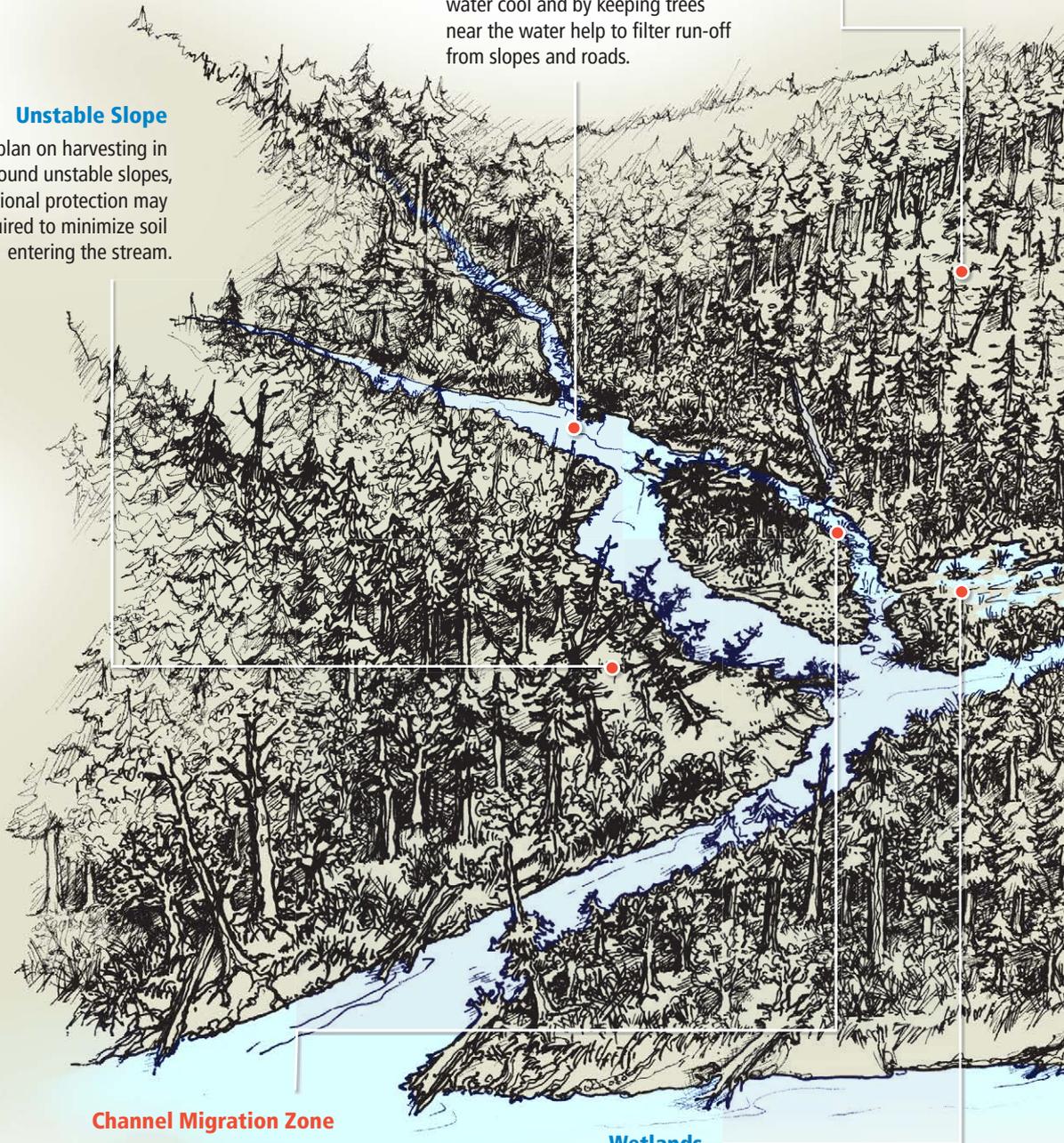
If you plan on harvesting in or around unstable slopes, additional protection may be required to minimize soil entering the stream.

## Type 'F' Stream

These include streams, lakes, and ponds that are used by fish, amphibians, wildlife and for drinking water. RMZs on these waters protect fish habitat by retaining shade trees to keep the water cool and by keeping trees near the water help to filter run-off from slopes and roads.

## Thinning

A landowner may want to thin their stand of trees if their management goal is to create larger trees to be harvested at a later time.



## Channel Migration Zone

The log jam blocking the entrance of this channel will rot or be displaced by the adjacent stream channel. This area will need to be protected as part of the Riparian Management Zone.

## Wetlands

An area of 1/4 acre or more covered by open water seven consecutive days between April 1 and October 1.

**Type 'F' Stream**

A culvert that restricted fish passage was removed.

**Type 'Np' Stream**

These flow year round either on the surface of the stream bed or sometimes below the surface for some distance. Buffers on these waters provide habitat for amphibians, protect downstream fish habitat and water quality.

**Type 'Ns' Stream**

These do not flow year round, but are connected above ground to a Type S, F, or Np stream. Buffers are not required on these streams. However, since they connect to fish habitat or drinking water, use of heavy equipment is limited to 30 feet on each side of these streams.

**Leave Trees**

This is a clump of green recruitment trees surrounding a wildlife reserve tree (snag).

**Water Bar**

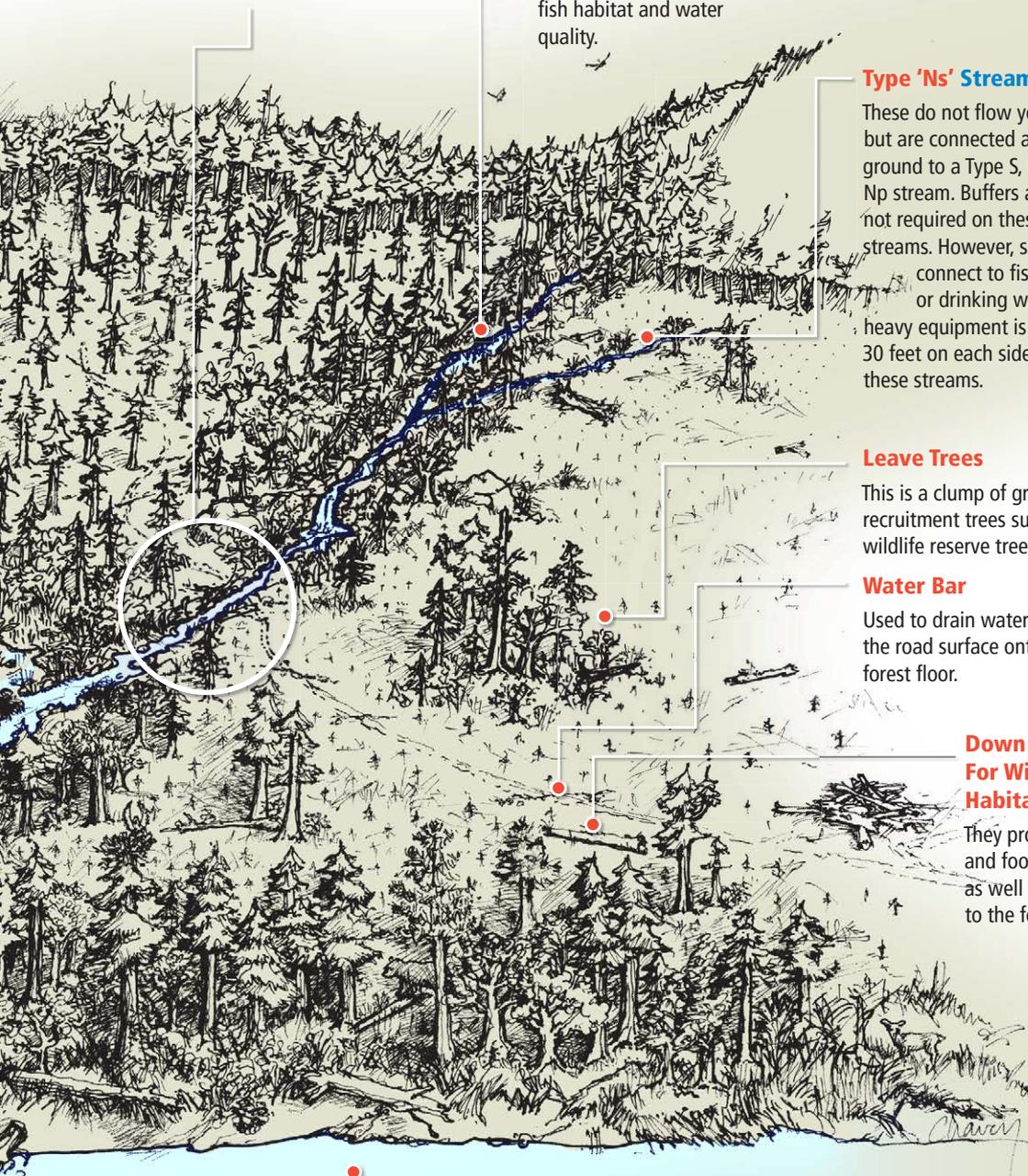
Used to drain water from the road surface onto the forest floor.

**Down Logs For Wildlife Habitat**

They provide shelter and food to wildlife as well as nutrients to the forest soil.

**Type 'S' Stream**

These are Shorelines of the State and are usually large, named rivers or creeks. If your forest practice activity is within 200 feet of Type S stream, please contact your county planning department. Some counties require permits for forest practices activities adjacent to Shorelines of the State.





# Riparian Management Zones\*

A Riparian Management Zone is the area that is located on each side of a Type S, F or Np stream where trees are left to provide protection from disturbance when forest practices activities are conducted. It is important to protect this area because it provides a mix of food and cover for aquatic species and protects water quality. The trees that are left provide shade and nutrients for the stream, as well as habitat for many wildlife species.

If you have a stream on your property, the following steps will help guide you in determining your Riparian Management Zone.

## FOLLOW THESE STEPS

- 1 DETERMINE THE TYPE OF STREAM(S) YOU HAVE ON YOUR PROPERTY**
- 2 DETERMINE THE WIDTH OF THE STREAM**
- 3 DETERMINE THE SITE CLASS OF YOUR RIPARIAN MANAGEMENT ZONE (RMZ)**
- 4 DETERMINE THE HARVEST OPTION**
- 5 MEASURE AND MARK YOUR RIPARIAN MANAGEMENT ZONE (RMZ)**

\* The landowner is responsible for verifying stream locations, determining the type of stream they have, and providing that information on the Forest Practices Activity map. If you disagree with the stream types on your Forest Practices activity map or have questions, contact your local DNR region office for assistance.

## 1

**DETERMINE THE STREAM TYPES YOU HAVE ON YOUR PROPERTY**

Obtain a copy of an activity map for your area that identifies the locations and types of streams. All maps and forms are available at your local DNR region office or online at [www.dnr.wa.gov/programs-and-services/forest-practices/review-applications-fpars/forest-practices-forms-and](http://www.dnr.wa.gov/programs-and-services/forest-practices/review-applications-fpars/forest-practices-forms-and). The following information will help guide you in determining what stream type(s) you have on your property.

**STREAM TYPE FISH**

These are Shorelines of the State and are usually large, named rivers or creeks. If your forest practices activity is within 200 feet of a Type S stream, please contact your county planning department. Some counties require permits for forest practices activities adjacent to Shorelines of the State.

**STREAM TYPE FISH**

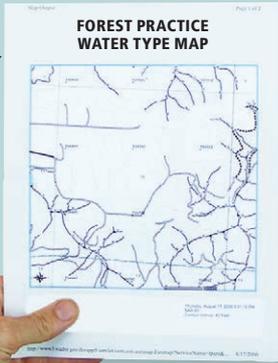
These include streams, lakes, and ponds that are used by fish, amphibians, wildlife, and for drinking water. Buffers on these waters protect fish habitat by retaining shade trees to keep the water cool and help to filter run-off from slopes and roads.

**STREAM TYPE Nperennial**

These flow year round either on the surface of the streambed or sometimes below the surface for some distance. Buffers on these waters provide habitat for amphibians, protect downstream fish habitat and water quality.

**STREAM TYPE Nseasonal**

These do not flow year round, but they connect to a Type S, F, or Np stream. There are no buffers required on these streams. However, because they connect to fish habitat or drinking water, use of heavy equipment is limited to 30 feet on each side of these waters.



## STREAM TYPE **U**

These are modeled streams that have not been verified in the field.

### GET THE WATER TYPE MAP ONLINE



You can get maps from the Forest Practices web site: [www.dnr.wa.gov/programs-and-services/forest-practices](http://www.dnr.wa.gov/programs-and-services/forest-practices). Maps also are available at your local DNR region office. You will need to know the section, township, and range of your activity to download or request a map. Please contact the county assessor for this information.

If you have questions about the map standards or the activity map, please contact the Forest Practices Help Desk at (360) 902-1420. The email address is [FPARS-ADMIN@dnr.wa.gov](mailto:FPARS-ADMIN@dnr.wa.gov). You may also contact the DNR region office for help.

All maps and forms that help you determine the stream types on your property are available online or at your local DNR region office.



The landowner is responsible for field verifying stream locations, determining the stream type, and providing that information on the Forest Practices Activity map. Forest Practices foresters will confirm your stream type. All streams within 200' of your proposed Forest Practices activity must be field verified.

If you disagree with the stream types on your Forest Practices activity map or have questions, contact your local DNR region office for assistance.

Western Washington and Eastern Washington Water Type Classification Worksheets are available on-line and will assist you with typing your streams: [www.dnr.wa.gov/forestpractices](http://www.dnr.wa.gov/forestpractices).

These are general descriptions of water types. For complete definitions, refer to WAC 222-16-031.

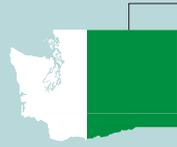
## 2

**DETERMINE THE WIDTH OF THE STREAM(S) ON YOUR PROPERTY**

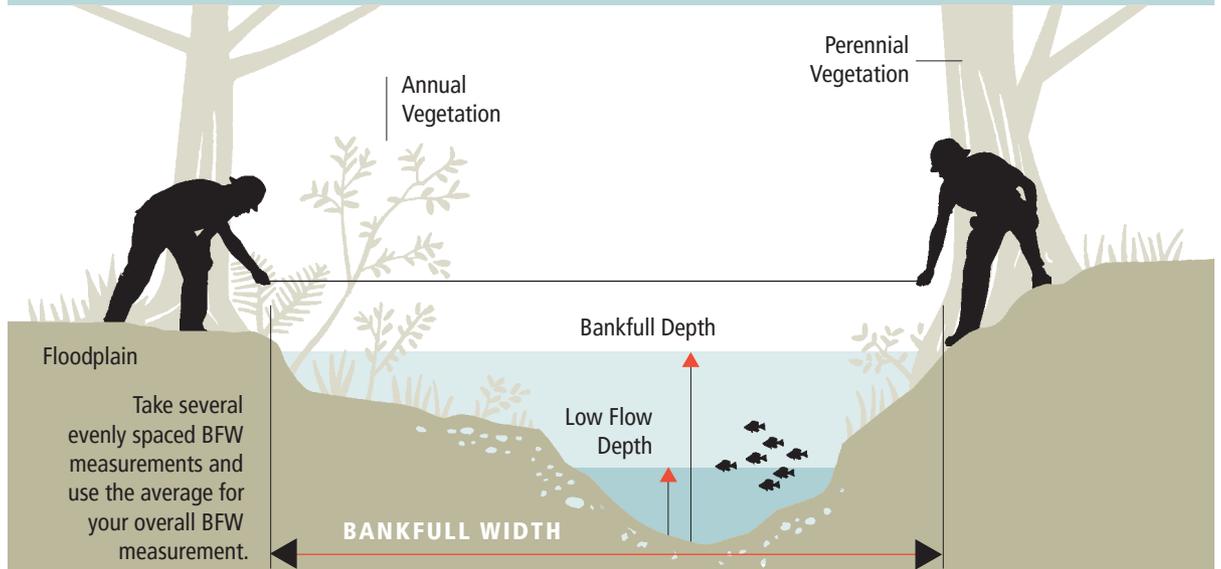
To determine the Riparian Management Zone for Type S and F streams in both Eastern and Western Washington, you will need to determine the bankfull width (BFW) distance for each stream or stream segment.

**WESTERN WASHINGTON**

Determine if your stream or stream segment is 10 feet or less bankfull width, or more than 10 feet bankfull width.

**EASTERN WASHINGTON**

Determine if your stream or stream segment is 15 feet or less bankfull width, or more than 15 feet bankfull width.

**HOW TO MEASURE THE BANKFULL WIDTH (BFW)**

To get an accurate measurement of your stream you will need to know about bankfull width (BFW). Bankfull width is often found, where you see a break in the slope or the erosion line in a steep stream bank caused by the stream. Where BFW is not easily found, it is best described as the point on the bank where plants change from water tolerant species to upland species. This point can be significantly wider than the actual width of the flowing stream, especially after periods of no rain. The BFW measurement is different for streams, lakes, ponds, impoundments, and tidal water.

To measure the width of your stream, take several evenly spaced BFW measurements and use the average of those measurements for your overall BFW measurement.

If side channels or braided channels are present, you will need to add those BFWs to determine your total stream BFW for an accurate measurement of the width of your stream.

FOREST  
PRACTICES  
MANUAL

See the **Board Manual Section 2** for details on measuring bankfull width (BFW).

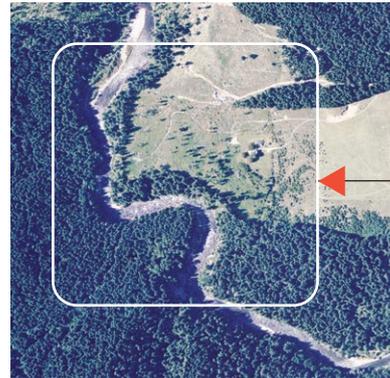
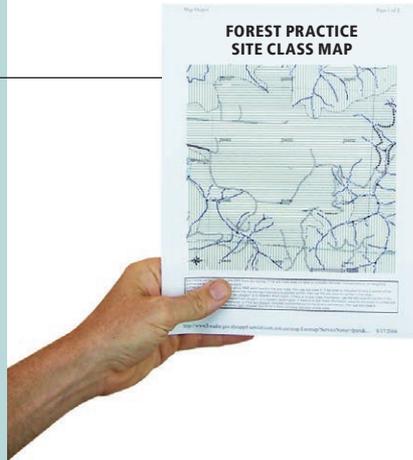
### 3 DETERMINE THE SITE CLASS OF YOUR RIPARIAN MANAGEMENT ZONE (RMZ)

The site class is a growth potential rating for trees within a given area based upon soil surveys.

The designated site class along type S or F streams or stream segments will determine the width of the riparian management zone.

 Site class maps are available at your local DNR region office or online at: [www.dnr.wa.gov/programs-and-services/forest-practices/review-applications-fpars/forest-practices-forms-and](http://www.dnr.wa.gov/programs-and-services/forest-practices/review-applications-fpars/forest-practices-forms-and).

To get an accurate measurement of your stream you will need to know about bankfull width (BFW). Bankfull width is often found where you see a break in slope or where the stream has created an erosion line in the stream bank.



#### WHAT IF MY PARCEL IS 20 ACRES OR LESS?

If your harvest is on a parcel that totals 20 contiguous acres or less, and you own less than a total of 80 acres of forest land in Washington State, you have different riparian protection requirements.

Your actual Riparian Management Zone may have varying widths with minimum and maximum distances. Within these distances, your tree count, shade requirements, and physical features of the landscape will determine your RMZ boundary and allow you to design your harvest unit.

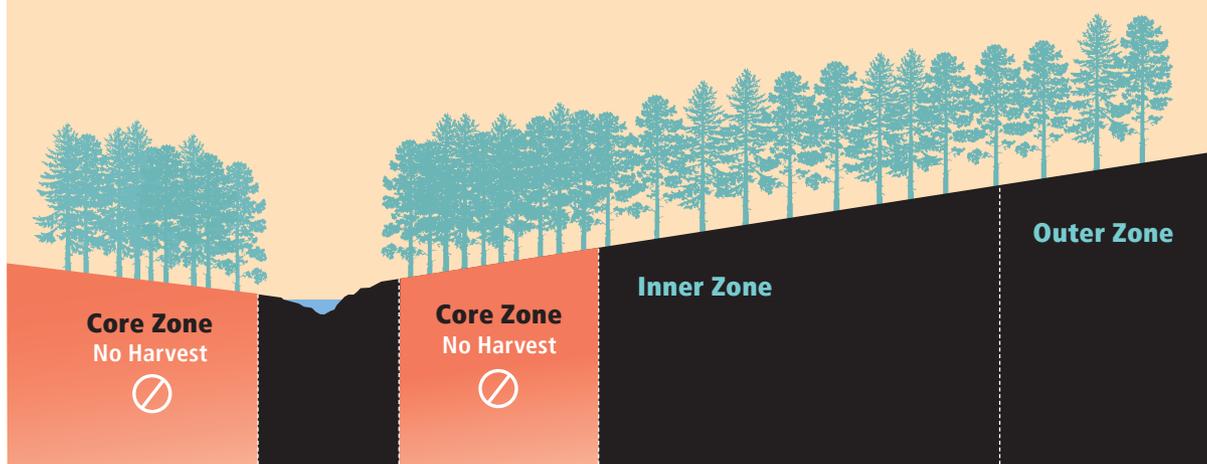
**Please contact DNR if you need assistance.**

Landowners with exempt 20-acre parcels should review the Forest Practices Rules for specifications on what you will need to do for your 20-acre parcel. Also see WAC 222-30-023.

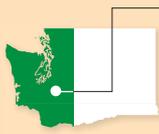


Step 4a is the option to not harvest within the inner zone.

Using the charts on the next page, apply the following widths to your Riparian Management Zone (RMZ) and then go to step 5 on page 88.



# 4a No Inner Zone Harvest



WESTERN WASHINGTON

**S | F**

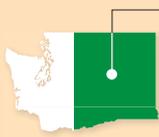
## TYPE 'S' OR 'F' WESTERN WASHINGTON RMZ REQUIREMENTS



TYPES 'S' AND 'F'  
ARE FISH HABITAT  
STREAMS

Site Class	Total RMZ Width	Core Zone Width <sup>1</sup>	Inner Zone Width <sup>2</sup>		Outer Zone Width <sup>3</sup>	
			Stream ≤ 10'	Stream > 10'	Stream ≤ 10'	Stream > 10'
I	200'	50'	83'	100'	67'	50'
II	170'	50'	63'	78'	57'	42'
III	140'	50'	43'	55'	47'	35'
IV	110'	50'	23'	33'	37'	27'
V	90'	50'	10'	18'	30'	22'

No Harvest



EASTERN WASHINGTON

**S | F**

## TYPE 'S' OR 'F' EASTERN WASHINGTON RMZ REQUIREMENTS



TYPES 'S' AND 'F'  
ARE FISH HABITAT  
STREAMS

### Bankfull width less than or equal to 15 feet

Site Class	Total RMZ Width	Core Zone Width <sup>1</sup>	Inner Zone Width <sup>2</sup>	Outer Zone Width <sup>3</sup>
I	130'	30'	45'	55'
II	110'	30'	45'	35'
III	90'	30'	45'	15'
IV	75'	30'	45'	0'
V	75'	30'	45'	0'

No Harvest

<sup>1</sup> Measured from outer edge of bankfull width (BFW) or outer edge of Channel Migration Zone (CMZ), whichever is greater.

<sup>2</sup> Measured from outer edge of Core Zone.

<sup>3</sup> Measured from outer edge of Inner Zone.

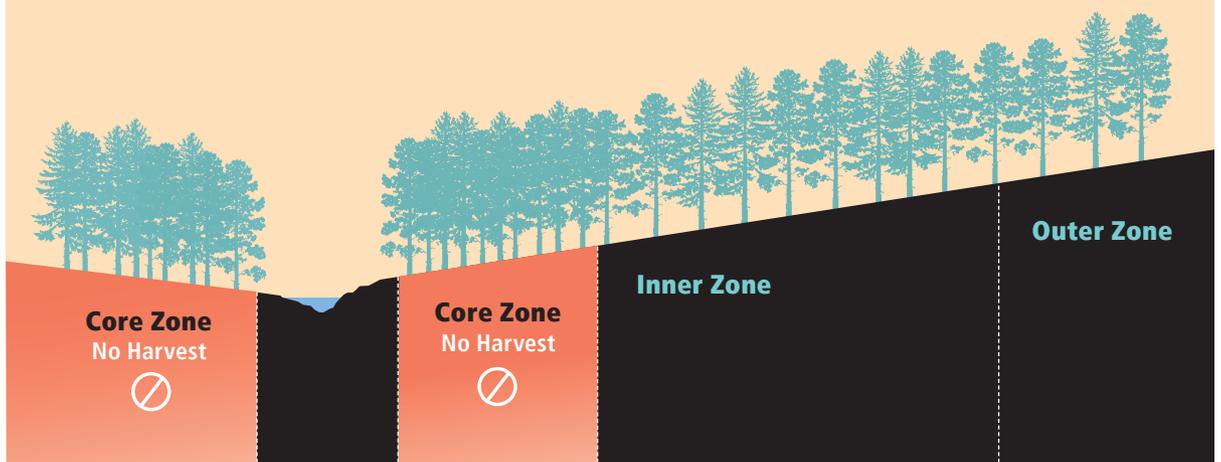
### Bankfull width greater than 15 feet

Site Class	Total RMZ Width	Core Zone Width <sup>1</sup>	Inner Zone Width <sup>2</sup>	Outer Zone Width <sup>3</sup>
I	130'	30'	70'	30'
II	110'	30'	70'	10'
III	100'	30'	70'	0'
IV	100'	30'	70'	0'
V	100'	30'	70'	0'

No Harvest

**Step 4b is the option to harvest in the Inner Zone. This option differs between Western and Eastern Washington.**

**In the next pages you will find the harvest options that help protect fish and wildlife, while allowing you to harvest in your Riparian Management Zone.**



**4b**

**DETERMINE THE HARVEST OPTION | WESTERN WASHINGTON**



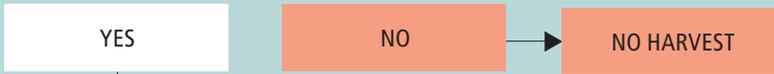
How you harvest adjacent to a Type S, F or Np stream in Western Washington is based upon stream width, site class, and shade requirements needed to protect your stream(s).

**A. HOW WIDE IS YOUR RIPARIAN MANAGEMENT ZONE (RMZ)?**

Once you have determined the site class and know the width of your stream, you need to determine the maximum width of your RMZ. Using the charts on the next pages, add the core, inner, and outer zone widths. This total width is the maximum width of your RMZ.

**B. DO YOU HAVE ADEQUATE SHADE?**

You can harvest inside the inner zone only if there is adequate shade present. See WAC 222-30-040



**C. DO YOU MEET THE DESIRED FUTURE CONDITION (DFC) REQUIRED?**

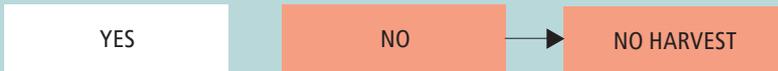
**Desired Future Condition  
Target Basal Area at 140 years**

Site Class I	325 sq. feet per acre
Site Class II	325 sq. feet per acre
Site Class III	325 sq. feet per acre
Site Class IV	325 sq. feet per acre
Site Class V	325 sq. feet per acre

Knowing the age of your trees and its basal area, you can calculate the Desired Future Condition. A computer program will help you determine this. See page 80 to learn how to calculate the basal area.



See the **Board Manual Section 7.**



**Inner Zone | Option 1**

**Thinning from Below Canopy**

This option is explained in the following two pages.

**Inner Zone | Option 2**

**Leave Trees Closest to Water**

This option is explained in pages 76 and 77.

**Outer Zone**

You must leave 20 riparian leave trees per acre after harvest. Leave trees in the outer zone may be dispersed or clumped. See WAC 222-30-021 for species and size.

## LEAVE TREE REQUIREMENTS

## Option 1 | Thinning from Below Canopy

WESTERN  
WASHINGTON

S | F

TYPE 'S' OR 'F'  
WESTERN  
WASHINGTONTYPES 'S' AND 'F'  
ARE FISH HABITAT  
STREAMS

## Bankfull width less than or equal to 10 feet

	River/Stream	Channel Migration Zone	Core Zone Width	Inner Zone Width		Outer Zone Width
<b>SITE CLASS I</b> 200' WIDE RMZ	Bankfull Width/Channel Migration Zone	Bankfull Width/Channel Migration Zone	50'	83'		67'
<b>SITE CLASS II</b> 170' WIDE RMZ			50'	63'	57'	
<b>SITE CLASS III</b> 140' WIDE RMZ			50'	43'	47'	
<b>SITE CLASS IV</b> 110' WIDE RMZ			50'	23'	37'	
<b>SITE CLASS V</b> 90' WIDE RMZ			50'	30'		
			No Harvest	10'		

The width of the inner zone depends on the width of your river/stream(s).

## Bankfull width greater than 10 feet

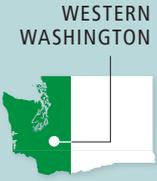
	River/Stream	Channel Migration Zone	Core Zone Width	Inner Zone Width		Outer Zone Width
<b>SITE CLASS I</b> 200' WIDE RMZ	Bankfull Width/Channel Migration Zone	Bankfull Width/Channel Migration Zone	50'	100'		50'
<b>SITE CLASS II</b> 170' WIDE RMZ			50'	78'	45'	
<b>SITE CLASS III</b> 140' WIDE RMZ			50'	55'	35'	
<b>SITE CLASS IV</b> 110' WIDE RMZ			50'	33'	27'	
<b>SITE CLASS V</b> 90' WIDE RMZ			50'	18'	20'	

The width of the inner zone depends on the width of your river/stream(s).

The option to thin from below in Western Washington is determined by many factors. The most significant of these factors is the amount of basal area that can be harvested.

LEAVE TREE REQUIREMENTS

Option 1 | Thinning from Below Canopy



SF

TYPE 'S' OR 'F'  
WESTERN  
WASHINGTON

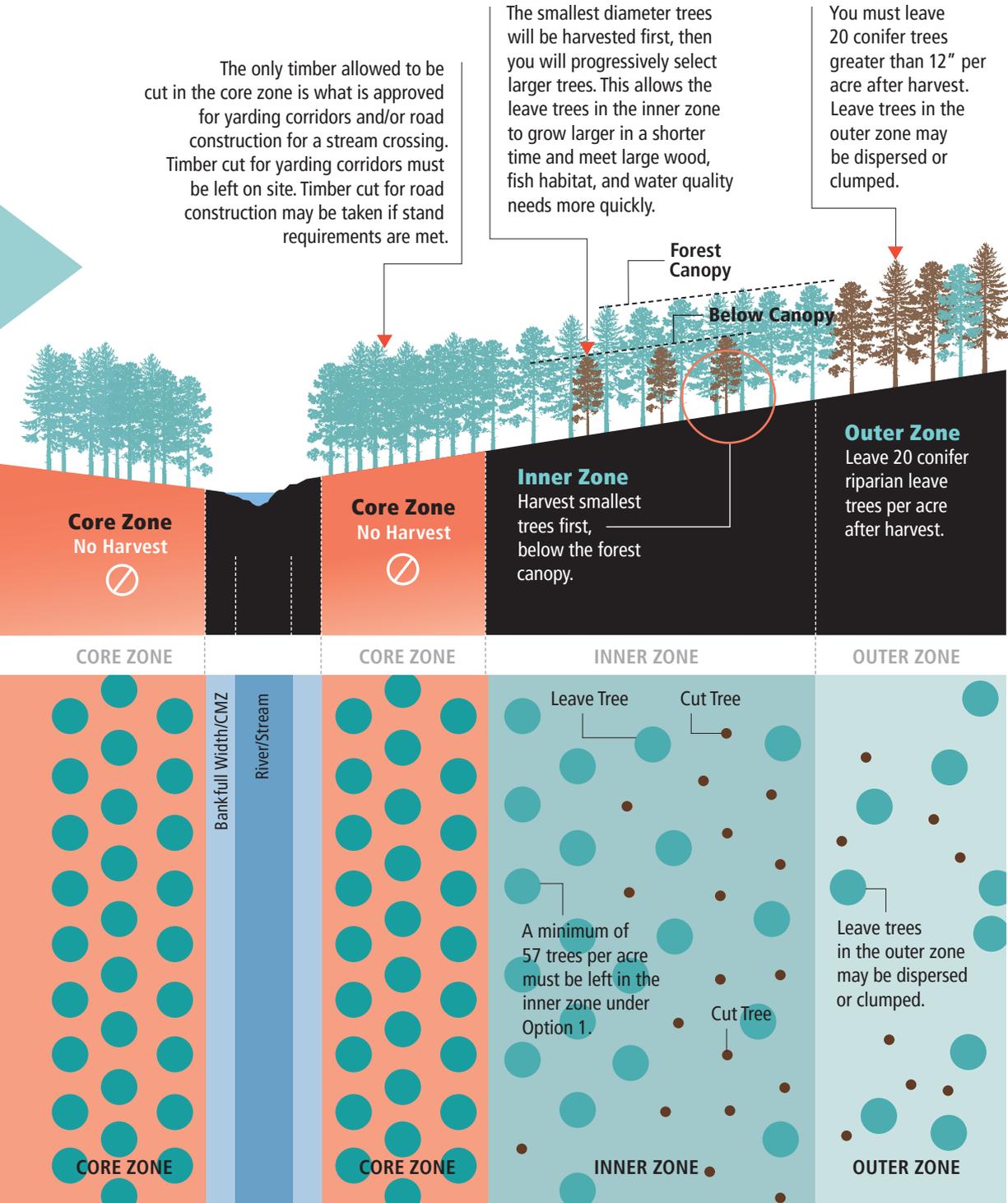


TYPES 'S' AND 'F'  
ARE FISH HABITAT  
STREAMS

The only timber allowed to be cut in the core zone is what is approved for yarding corridors and/or road construction for a stream crossing. Timber cut for yarding corridors must be left on site. Timber cut for road construction may be taken if stand requirements are met.

The smallest diameter trees will be harvested first, then you will progressively select larger trees. This allows the leave trees in the inner zone to grow larger in a shorter time and meet large wood, fish habitat, and water quality needs more quickly.

You must leave 20 conifer trees greater than 12" per acre after harvest. Leave trees in the outer zone may be dispersed or clumped.



1 DETERMINE THE TYPE OF STREAM 2 DETERMINE THE WIDTH OF STREAM 3 DETERMINE THE SITE CLASS 4 DETERMINE THE HARVEST OPTION 5 MARK YOUR RMZ

## LEAVE TREE REQUIREMENTS

WESTERN  
WASHINGTON

## Option 2 | Leaving Trees Closest to Water



S F

TYPE 'S' OR 'F'  
WESTERN  
WASHINGTONTYPES 'S' AND 'F'  
ARE FISH HABITAT  
STREAMS

## Bankfull width less than or equal to 10 feet

	River/Stream	Bankfull Width/CMZ	Core Zone Width	Inner Zone Width	Outer Zone Width
<b>SITE CLASS I</b> 200' WIDE RMZ	River/Stream	Bankfull Width/CMZ	50'	84'	66'
<b>SITE CLASS II</b> 170' WIDE RMZ	Bankfull Width/CMZ	Bankfull Width/CMZ	50'	64'	56'
<b>SITE CLASS III</b> 140' WIDE RMZ	Bankfull Width/CMZ	Bankfull Width/CMZ	50'	44'	46'

The width of the inner zone depends on the width of your river/stream(s).

No Harvest

30' No Harvest Extension

## Bankfull width greater than 10 feet

	River/Stream	Bankfull Width/CMZ	Core Zone Width	Inner Zone Width	Outer Zone Width
<b>SITE CLASS I</b> 200' WIDE RMZ	River/Stream	Bankfull Width/CMZ	50'	84'	66'
<b>SITE CLASS II</b> 170' WIDE RMZ	Bankfull Width/CMZ	Bankfull Width/CMZ	50'	70'	50'

The width of the inner zone depends on the width of your river/stream(s).

No Harvest

50' No Harvest Extension

The option to leave trees closest to the stream in Western Washington is determined by multiple factors including site class and basal area.

LEAVE TREE REQUIREMENTS

Option 2 | Leaving Trees Closest to Water



SF

TYPE 'S' OR 'F'  
WESTERN  
WASHINGTON



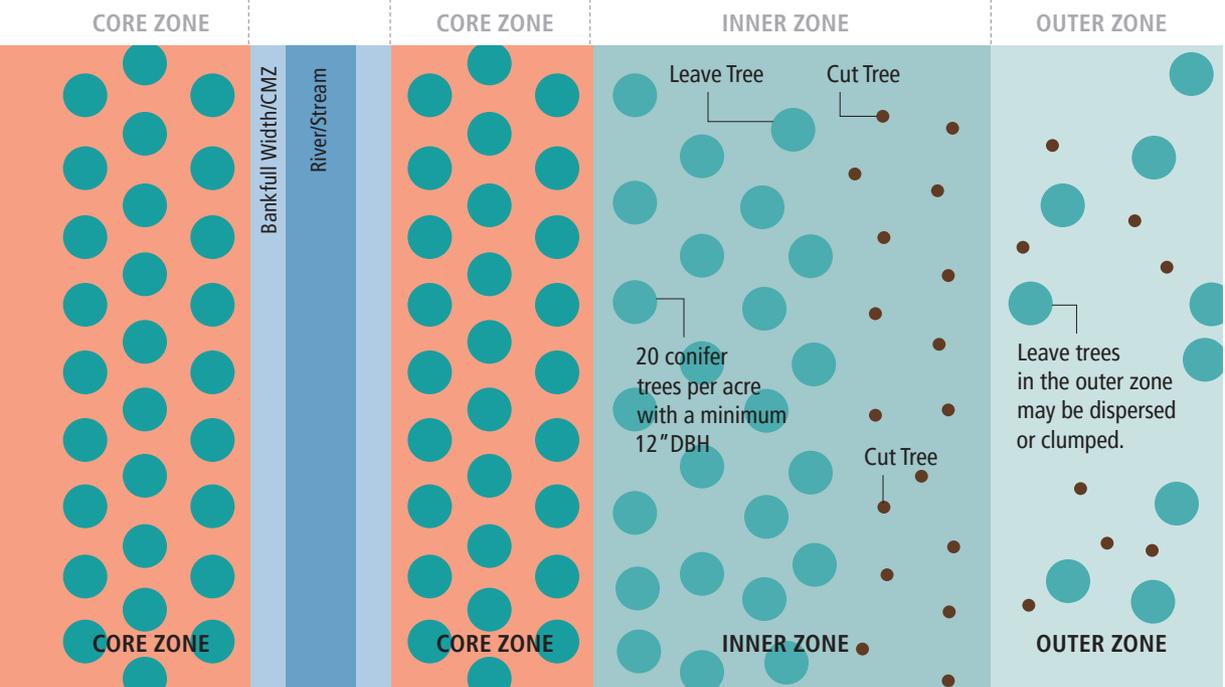
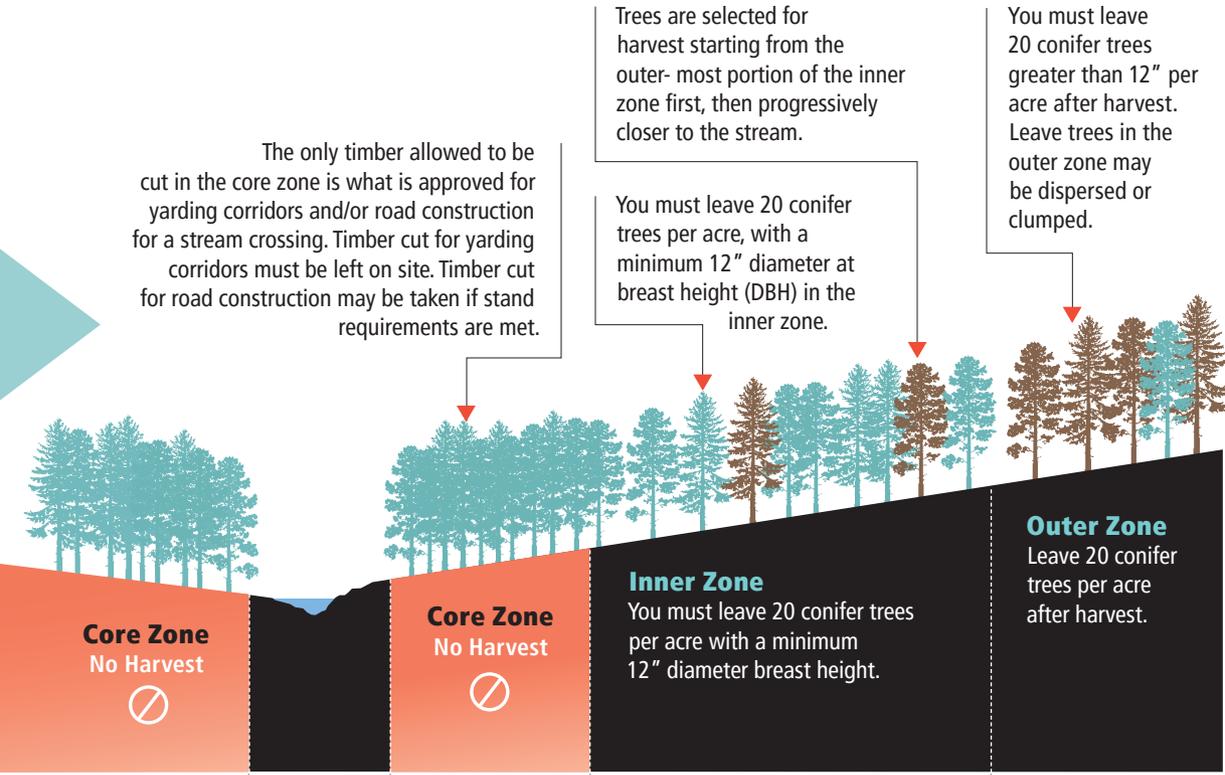
TYPES 'S' AND 'F'  
ARE FISH HABITAT  
STREAMS

The only timber allowed to be cut in the core zone is what is approved for yarding corridors and/or road construction for a stream crossing. Timber cut for yarding corridors must be left on site. Timber cut for road construction may be taken if stand requirements are met.

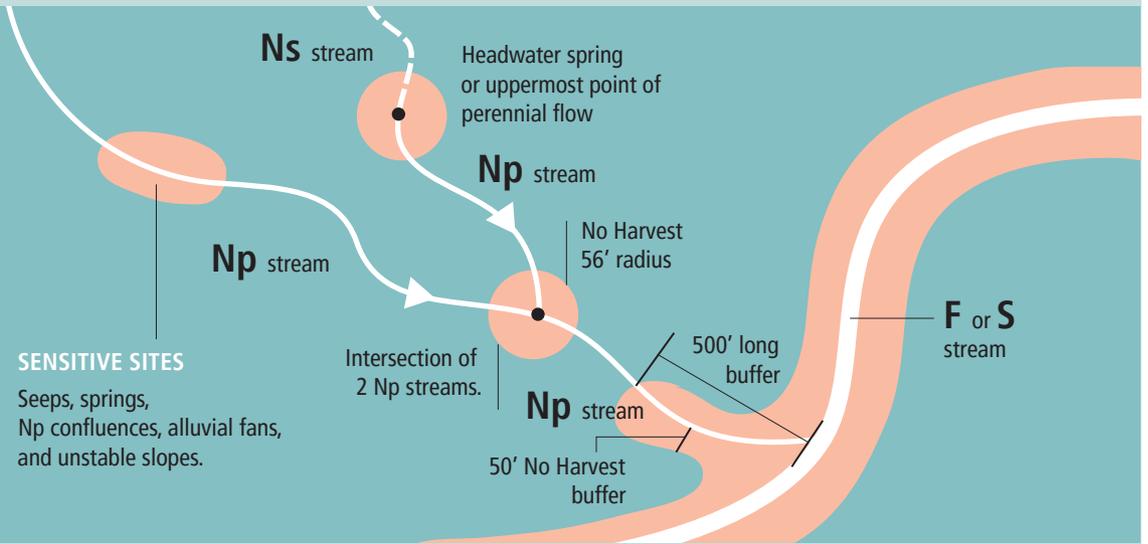
Trees are selected for harvest starting from the outer- most portion of the inner zone first, then progressively closer to the stream.

You must leave 20 conifer trees per acre, with a minimum 12" diameter at breast height (DBH) in the inner zone.

You must leave 20 conifer trees greater than 12" per acre after harvest. Leave trees in the outer zone may be dispersed or clumped.



1 DETERMINE THE TYPE OF STREAM 2 DETERMINE THE WIDTH OF STREAM 3 DETERMINE THE SITE CLASS 4 DETERMINE THE HARVEST OPTION 5 MARK YOUR RMZ



# Np

## TYPE 'Np' STREAMS RMZ REQUIREMENTS WESTERN WASHINGTON



Protection of Type Np streams and sensitive sites is very important as they contribute to the

quality of water and fish habitat in downstream Type S and/or F streams. They also provide habitat to a variety of wildlife. Type Np streams have a 30 foot equipment limitation zone (ELZ).

If your Np stream is longer than 1,000' and is more than 500' upstream from a Type S or F stream, refer to the Western Washington Type Np RMZ Worksheet. Determine the distance of buffer protection required. The worksheet can be found in the Forest Practices Application instructions.

Sensitive sites associated with Np streams must also be protected. See the chart to the right.



See the **Board Manual Section 7** and Forest Practices Application Worksheet.

### Np RIPARIAN MANAGEMENT ZONE

**Length of Type Np stream from S or F stream**

**Length of 50' no touch RMZ required on Type Np stream starting at S or F stream**

Greater than 1,000'

500'

Greater than 300' but less than 1,000'

50% of entire length or 300', whichever is greater

Less than or equal to 300'

The entire length of Type Np stream

### WHAT ARE SENSITIVE SITES AND WHAT PROTECTION DO THEY NEED?

Headwater spring or in absence of headwater spring, the upper most point of perennial flow.

**56-foot radius buffer centered on the sensitive site.**

Intersection on two or more Type Np waters

**56-foot radius buffer centered on the intersection.**

Perennially saturated side-slope seep

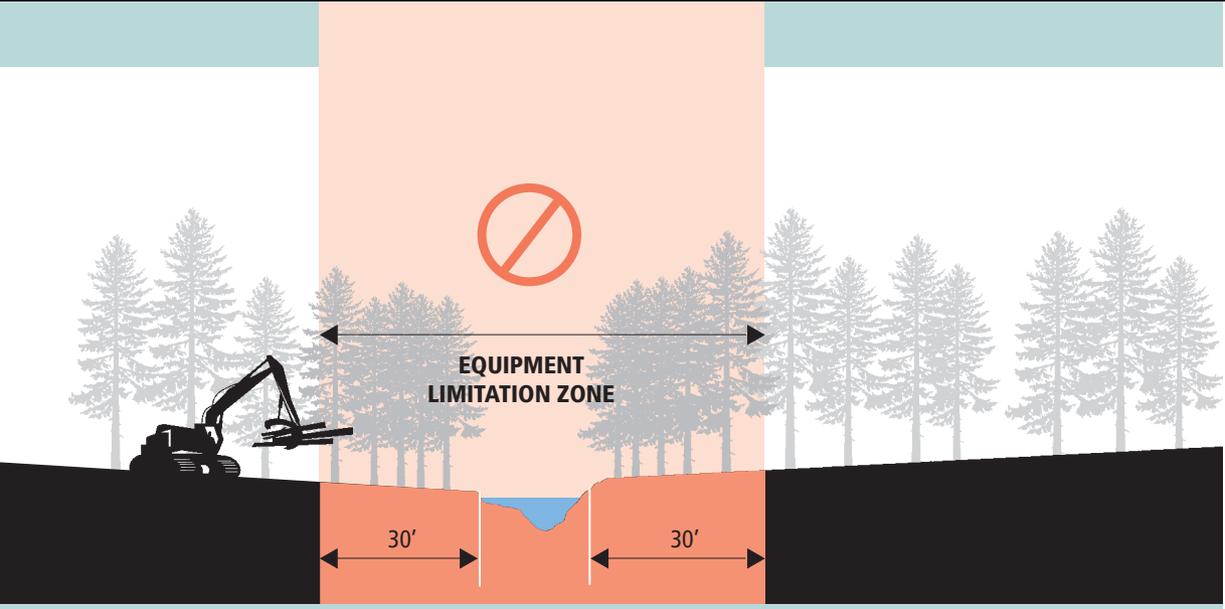
**50' buffer from outer edge of saturated area.**

Perennially saturated headwall seep

**50' buffer from outer edge of saturated area.**

Alluvial fan

**No harvest within this area.**



# Ns

## TYPE 'Ns' STREAMS RMZ REQUIREMENTS WESTERN WASHINGTON



Buffers are not required for type Ns streams. There is a 30-foot equipment limitation zone.

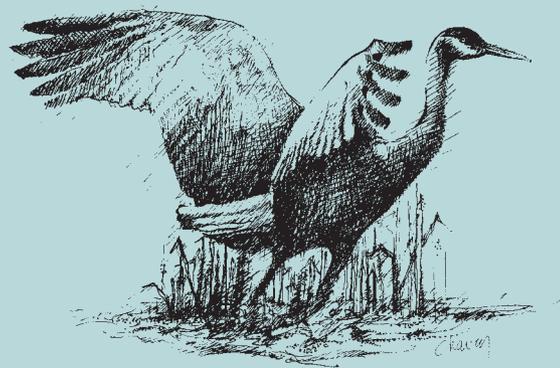
### 30-foot Equipment Limitation Zone (ELZ)

This is a 30-foot wide zone that limits surface disturbances caused by equipment. It is measured from the outer edge of bankfull width. It applies to all type Ns and Np streams. Mitigation is required if harvest activities expose the soil on more than 10 percent of the ELZ length.

### Shade

Shade trees greatly influence stream temperature and help provide cool water for fish and other aquatic species. Consider purposefully placing your required leave trees to provide additional stream protection.

Shade trees greatly influence stream temperature and help provide cool water for fish and other aquatic species.



TYPES 'Np' AND 'Ns' ARE NON-FISH HABITAT STREAMS

SANDHILL CRANE ILLUSTRATION BY JANE CHAVEY / DNR

1 DETERMINE THE TYPE OF STREAM 2 DETERMINE THE WIDTH OF STREAM 3 DETERMINE THE SITE CLASS 4 DETERMINE THE HARVEST OPTION 5 MARK YOUR RMZ

WESTERN WASHINGTON

# How to Calculate the Basal Area of a Forest

**Basal area is an important measurement. If you know basal area you can calculate the number of trees per acre.**

**FOREST PRACTICES MANUAL**

See the Board Manual Section 7 to help you determine whether you

can harvest in the inner and outer zones of your Riparian Management Zone.

Add the individual basal area of every tree on an acre and you have the basal area per acre. Basal area is expressed as square feet per acre.

## What is Basal Area?

Basal area (BA) is a calculation to determine the amount of area a tree takes up in the forest.

Basal area is usually calculated on a per-acre basis in order to know how much surface area (square feet) the trees are occupying on each acre.

The basal area of a tree is calculated by measuring its diameter.

Measure the tree at 4.5 feet above the ground on the uphill side which is referred to as DBH (diameter at breast height).

If you know basal area you can calculate the number of trees per acre.

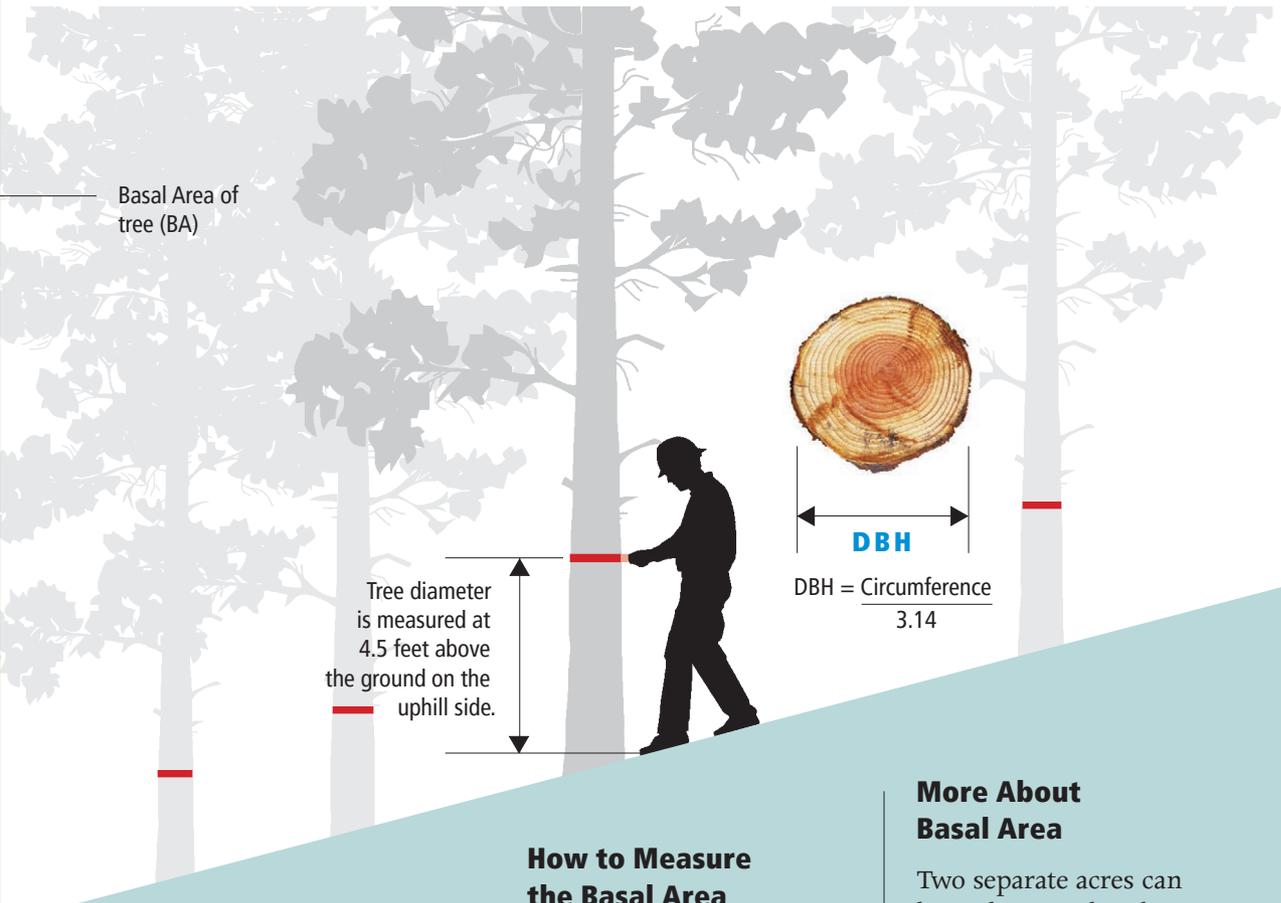
When you add the individual basal area of every tree on an acre you can then determine how many trees you can remove.

Diameter of tree at Breast Height (DBH)

DBH	BA
6"	.20 sq ft
8	.35
10	.55
12	.79
14	1.1
16	1.4
18	1.8
20	2.2
22	2.6
24	3.1
26	3.7
28	4.3
30	4.9
32	5.6
34	6.3
36	7.1
38	7.9
40	8.7
42	9.6
44	10.6
46	11.5
48	12.6
50	13.6
52	14.8
54	15.9
56	17.1
58	18.3
60	19.6

This table shows the Diameter at Breast Height (DBH) in inches, and its corresponding Basal Area (BA) in square feet.

A diameter tape measures a tree's circumference and converts it to diameter in inches.



**In Western Washington, inner zone harvest is based on the Desired Future Condition (DFC) model. This model will provide all the information necessary to lay out an inner zone harvest.**

**How to Measure the Basal Area**

There are two common ways to measure DBH. Use the chart to determine BA:

- 1 A diameter tape measures a tree's circumference and converts it automatically to diameter in inches.
- 2 A household tape measure can be used to measure the circumference of a tree. Convert the circumference to diameter by using the following formula:

$$DBH = \frac{\text{Circumference}}{3.14}$$

**Example**

250 trees on an acre which all have diameters of 12 inches DBH (0.8 square feet) would total 196 square feet of basal area.

$$0.8 \times 250 = 196.3 \text{ square feet of basal area}$$

**More About Basal Area**

Two separate acres can have the same basal area but a different number of trees. The tree diameter is an important factor.



This acre has a basal area of 78.5 with **24-inch** diameter trees



This acre has a basal area of 78.5 with **6-inch** diameter trees

## 4b

## DETERMINE THE HARVEST OPTION | EASTERN WASHINGTON



How you harvest adjacent to a Type S, F or Np stream (see page 66) in Eastern Washington is based upon the site class, timber habitat type, and shade requirements needed to protect your stream(s).

## A. HOW WIDE IS YOUR RIPARIAN MANAGEMENT ZONE (RMZ)?

Once you have determined the site class and know the width of your stream, using the charts below, add the core, inner, and outer zone widths to determine the maximum width of your RMZ.

S | F

TYPE 'S' OR 'F'  
EASTERN WASHINGTON  
RMZ REQUIREMENTSBankfull width less than  
or equal to 15 feet

	River/Stream	Bankfull Width/Channel Migration Zone	Core Zone Width	Inner Zone Width	Outer Zone Width
<b>SITE CLASS I</b> 130' WIDE RMZ	River/Stream	Channel Migration Zone	30'	45'	55'
<b>SITE CLASS II</b> 110' WIDE RMZ		Channel Migration Zone	30'	45'	35'
<b>SITE CLASS III</b> 90' WIDE RMZ		Bankfull Width/Channel Migration Zone	30'	45'	15'
<b>SITE CLASS IV</b> 75' WIDE RMZ		Bankfull Width/Channel Migration Zone	30'	45'	
<b>SITE CLASS V</b> 75' WIDE RMZ		Bankfull Width/Channel Migration Zone	30'	45'	

Not all streams in Eastern Washington will have an outer zone.

The width of the inner zone depends on the width of your river/stream(s).

## No Harvest

The only timber allowed to be cut in the core zone is what is approved for yarding corridors and/or road construction for a stream crossing. Timber cut for yarding corridors must be left on site.

TYPES  
'S' AND 'F' ARE  
FISH HABITAT  
STREAMS



S | F

TYPE 'S' OR 'F'  
EASTERN WASHINGTON  
RMZ REQUIREMENTSBankfull width greater  
than 15 feet

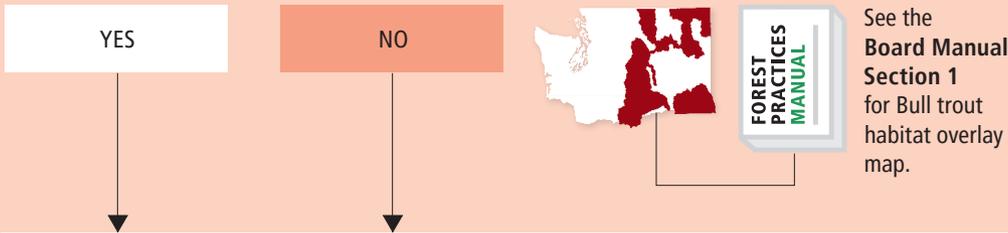
	River/Stream	Bankfull Width/Channel Migration Zone	Core Zone Width	Inner Zone Width	Outer Zone Width
<b>SITE CLASS I</b> 130' WIDE RMZ	River/Stream	Channel Migration Zone	30'	70'	30'
<b>SITE CLASS II</b> 110' WIDE RMZ		Channel Migration Zone	30'	70'	10'
<b>SITE CLASS III</b> 100' WIDE RMZ		Bankfull Width/Channel Migration Zone	30'	70'	
<b>SITE CLASS IV</b> 100' WIDE RMZ		Bankfull Width/Channel Migration Zone	30'	70'	
<b>SITE CLASS V</b> 100' WIDE RMZ		Bankfull Width/Channel Migration Zone	30'	70'	

Not all streams in Eastern Washington will have an outer zone.

## No Harvest

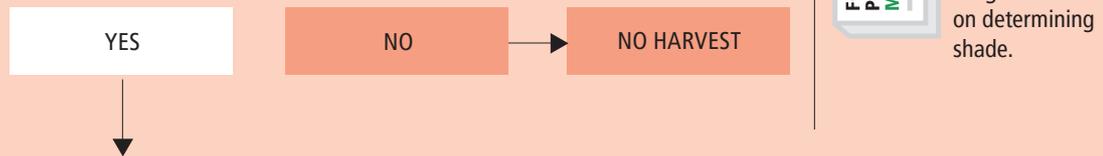
**B. IS YOUR HARVEST IN THE BULL TROUT OVERLAY?**

Harvest units within the bull trout overlay must leave all available shade within 75 feet of the bankfull width or CMZ, whichever is greater.

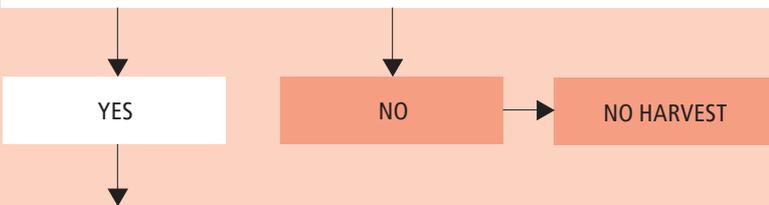


**C. DO YOU HAVE ADEQUATE SHADE?**

You can harvest inside the inner zone only if there is adequate shade present. The amount of shade required depends on whether the harvest unit is within the bull trout habitat overlay.



**D. DO YOU MEET THE BASAL AREA REQUIREMENTS?**



**YOU ARE ALLOWED TO HARVEST** | With the Following Requirements

**Inner Zone**

Leave tree requirements are based upon habitat type and elevation:

**Ponderosa Pine**

Elevations at or below 2500 feet.

**Mixed Conifer**

Elevations from 2501 feet to 5000 feet.

**High Elevation**

Elevations above 5000 feet.

The stand must meet certain basal area requirements. You must leave a certain number, size, and type of leave trees.

The stand must meet certain basal area requirements.

**Outer Zone**

Leave tree requirements are based upon habitat type and elevation:

**Ponderosa Pine**

Leave 10 dominant or co-dominant trees per acre.

**Mixed Conifer**

Leave 15 dominant or co-dominant trees per acre.

**High Elevation**

Leave 20 dominant or co-dominant trees per acre.

See **Leave Tree Requirements graphics on next pages**



LEAVE TREE REQUIREMENTS

Stands with High Basal Area

EASTERN WASHINGTON



SF

TYPE 'S' OR 'F'  
EASTERN  
WASHINGTON



TYPES 'S' AND 'F'  
ARE FISH HABITAT  
STREAMS

1 DETERMINE THE TYPE OF STREAM 2 DETERMINE THE WIDTH OF STREAM 3 DETERMINE THE SITE CLASS 4 DETERMINE THE HARVEST OPTION 5 MARK YOUR RMZ

**Ponderosa Pine**

**At or below 2,500 feet**

**Mixed Conifer**

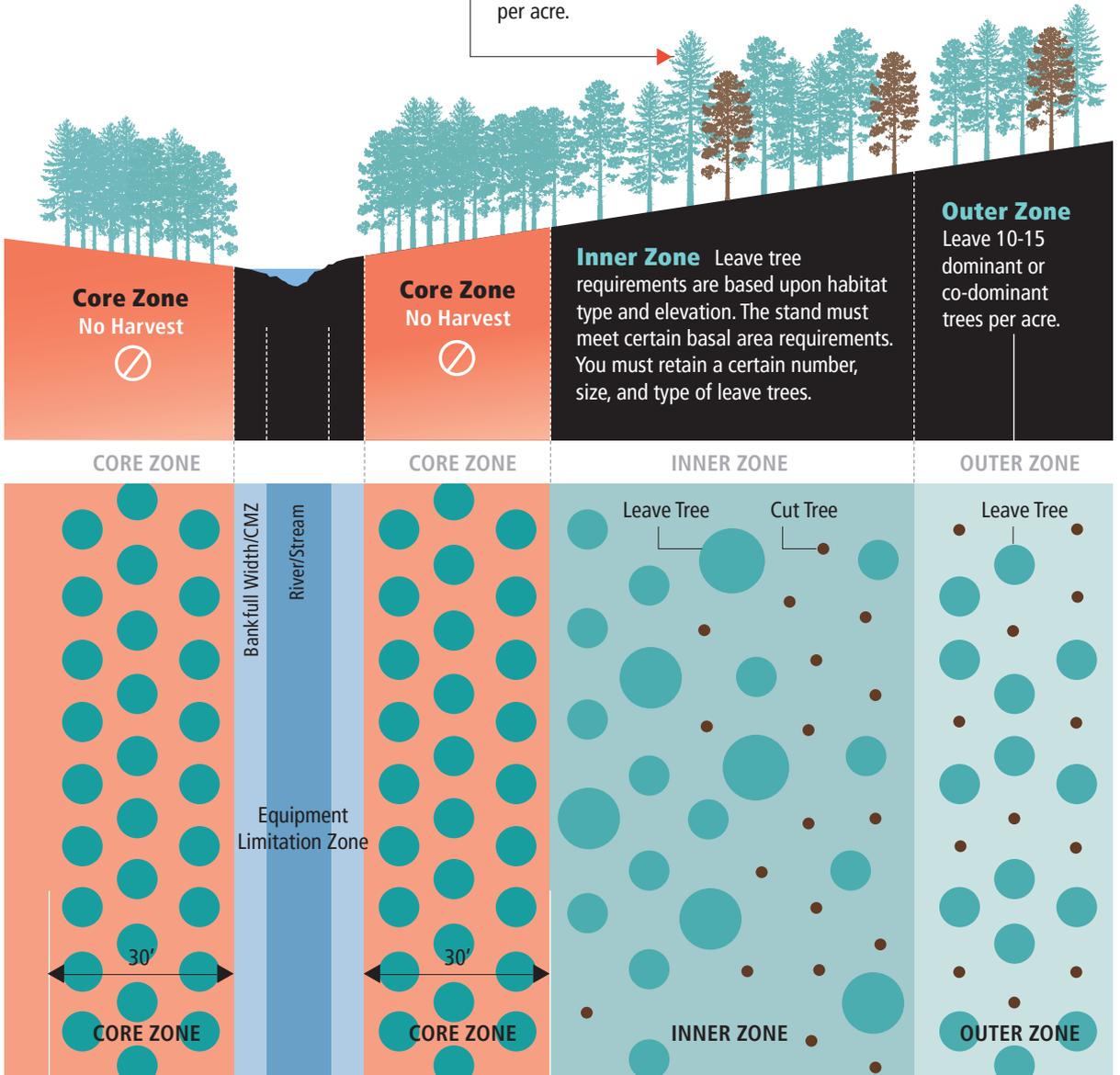
**from 2,500 to 5,000 feet**

Generally, you will have to leave 21 trees per acre with the largest diameters. If you don't meet basal area requirements, leave 29 trees per acre of the next available largest diameter trees.

If you still don't meet the basal area requirements you will need to leave all trees that are 6 inches in diameter and larger per acre.



Please refer to the Forest Practices Rules for your specific site: 222-30-022



LEAVE TREE REQUIREMENTS

High Elevation Stands



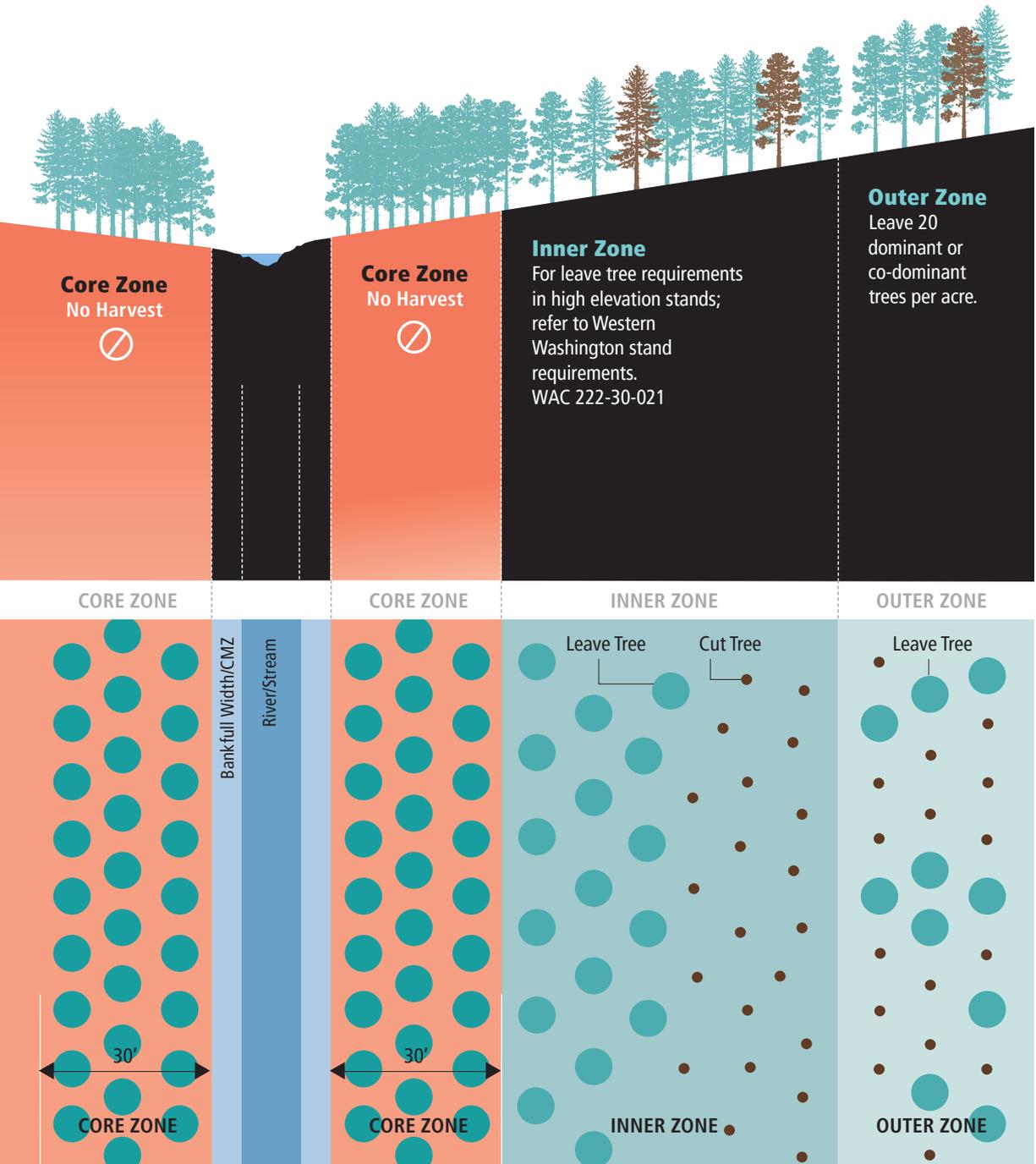
SF

TYPE 'S' OR 'F'  
EASTERN  
WASHINGTON



TYPES 'S' AND 'F'  
ARE FISH HABITAT  
STREAMS

High Elevation  
Above 5,000 feet



1 DETERMINE THE TYPE OF STREAM    2 DETERMINE THE WIDTH OF STREAM    3 DETERMINE THE SITE CLASS    4 DETERMINE THE HARVEST OPTION    5 MARK YOUR RMZ

Np

## TYPE 'Np' STREAMS RMZ REQUIREMENTS EASTERN WASHINGTON

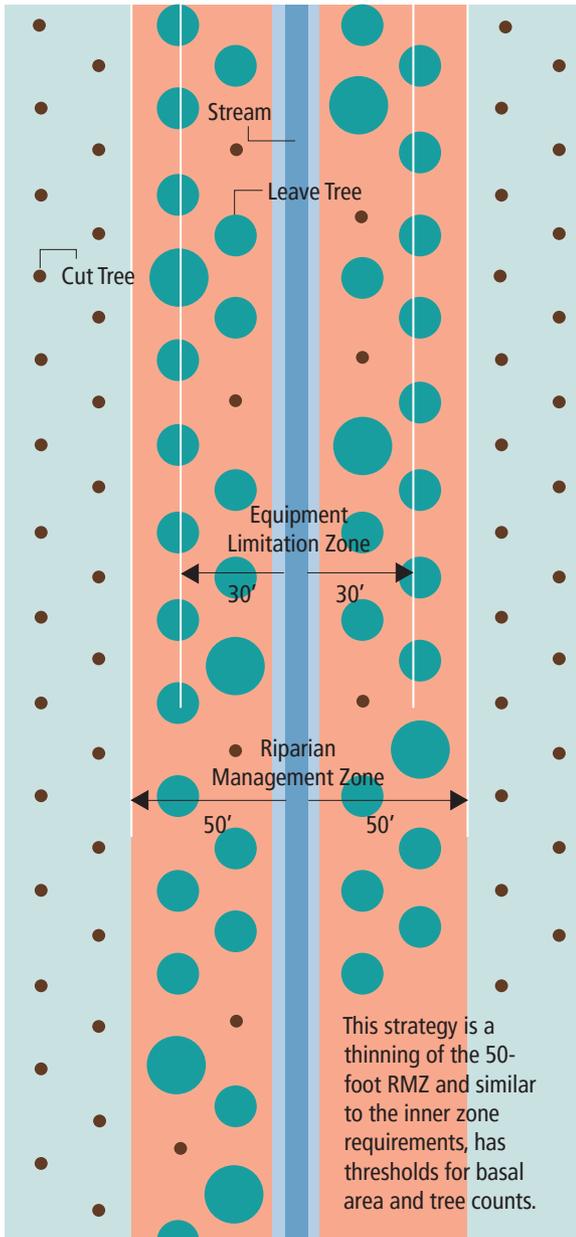


Type Np streams require a 50-foot Riparian Management Zone and a 30-foot equipment limitation zone. You may be able to harvest within this 50' buffer if you meet certain basal area requirements and tree counts (this is similar to the Inner Zone requirements for Type S or F streams).

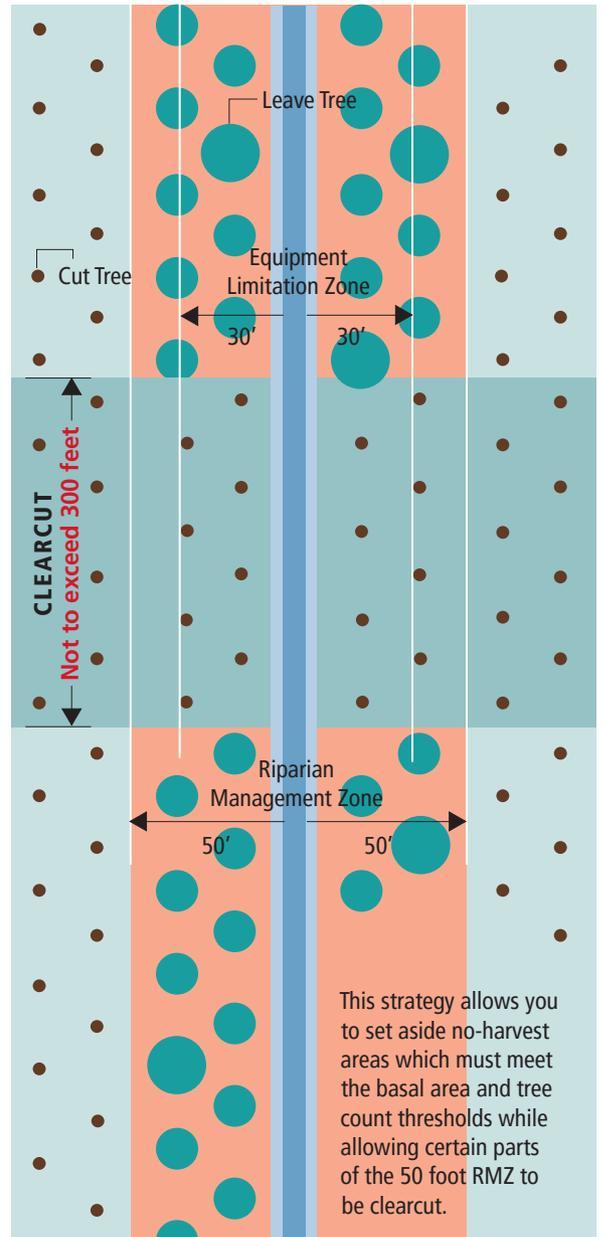
### What options do you have?

For Type Np streams, you can select one of two harvest strategies:

#### Partial Cut Strategy



#### Clearcut Strategy



Protection of Type Np, Ns streams and sensitive sites is very important as they contribute to the quality of water and fish habitat in downstream Type S and/or F streams.

# Ns

## TYPE 'Ns' STREAMS RMZ REQUIREMENTS EASTERN WASHINGTON



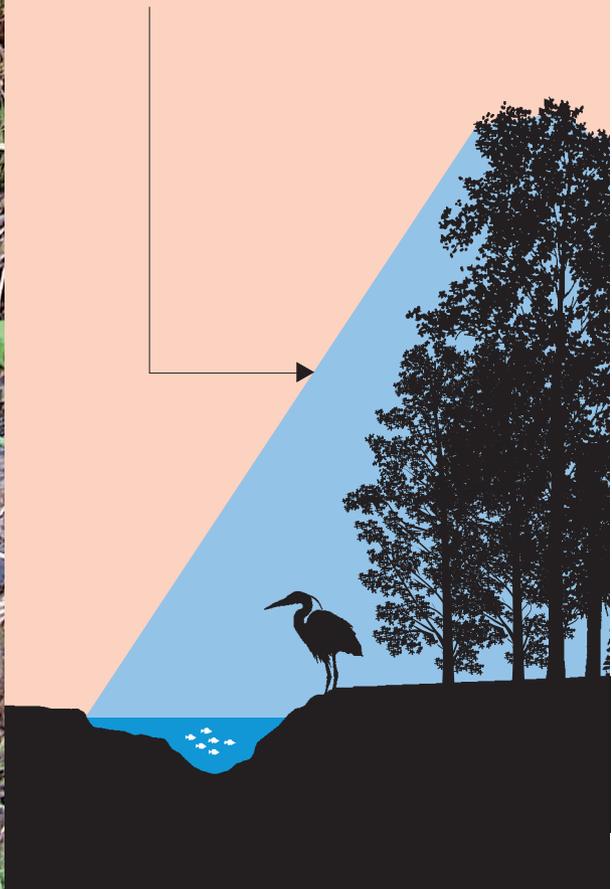
Buffers are not required for type Ns streams. There is a 30-foot equipment limitation zone.

### 30-foot Equipment Limitation Zone (ELZ)

This is a 30-foot wide zone that limits equipment use and disturbances. It is measured from the outer edge of bankfull width. It applies to all type Ns and Np streams. Mitigation is required if harvest activities expose the soil on more than 10 percent of the ELZ associated with each harvest activity.

### Shade

Shade trees greatly influence stream temperature and help provide cool water for fish and other aquatic species. Consider placing your required leave trees to provide additional stream protection.



1 DETERMINE THE TYPE OF STREAM 2 DETERMINE THE WIDTH OF STREAM 3 DETERMINE THE SITE CLASS 4 DETERMINE THE HARVEST OPTION 5 MARK YOUR RMZ



## 5

### MEASURE AND MARK YOUR RIPARIAN MANAGEMENT ZONE (RMZ)

▶ All measurements are taken horizontally, while keeping the measuring tape level at all times.

▶ Tree diameter measurements are taken at “diameter at breast height” or DBH. This measurement is taken with a diameter tape at a height of 4.5 feet from the ground.



▶ Bright tree-marking ribbon or paint is recommended. Using a different color for road location from the color used on the RMZ or harvest boundary helps eliminate confusion.

▶ Marking the proposal on the ground is very important. Clear marking helps to eliminate resource and property damage and delays in application processing.



See the **Board Manual Section 7** and Forest Practices Application Worksheet.

Identifying the proposal on the ground is very important. Clear marking helps to eliminate resource and property damage and delays in application processing.

# Suggestions for Success

**The following list has suggestions to help you achieve management objectives while protecting long-term investments and public resources. These suggestions may exceed Forest Practices Rules.**

- I have read the “Riparian Management Zones” section.
- Verify all stream types within 200 feet of your harvest, including those on your neighbor’s property (with the neighbor’s permission).
- Verify all stream types within 200 feet of any road construction, including those on your neighbor’s property (with the neighbor’s permission).
- Determine whether you will harvest within your Riparian Management Zone (RMZ).
- Identify and mark boundaries of the Channel Migration Zone (CMZ), if present.
- Identify and mark boundaries of RMZs.
- Retain trees necessary to meet shade requirements along streams.
- Determine which harvest strategy you will use based upon habitat type and stream width (Eastern WA) or site class and stream width (Western WA).
- Mark trees for removal within the inner and outer zones of your RMZ.
- Communicate management objectives to logging operator.
- Avoid disturbing stumps, root systems, or any logs within the stream channel or embedded in stream banks.
- Avoid damage to stream banks and riparian and wetland vegetation.
- ▶ Fall trees away from water and management zones.
- ▶ Use tree-length yarding where possible.
- ▶ Lift the leading end of the logs during skidding and/or yarding.
- Contact a consulting forester for assistance with your RMZ layout.
- Obtain all required permits from city, county, state, and federal agencies.





# Wetland Management Zones\*

A Wetland Management Zone (WMZ) is the area located around the perimeter of a wetland where trees are left to provide protection from disturbance. It is important to protect this area because it provides a mix of food and cover for aquatic species and protects water quality. The trees that are left provide shade and nutrients for the wetland, as well as habitat for many wildlife species.

If you have a wetland on your property, the following steps will help guide you in determining your Wetland Management Zone.

## FOLLOW THESE STEPS

- 1 DETERMINE WETLAND TYPES**
- 2 DETERMINE WETLAND MANAGEMENT ZONES**
- 3 CONDUCT A TREE INVENTORY WITHIN THE WETLAND MANAGEMENT ZONE**
- 4 MEASURE AND MARK YOUR WETLAND MANAGEMENT ZONE**

\* The landowner is responsible for verifying stream locations, determining the type of wetland you have, and providing that information on the Forest Practices Activity map. If you disagree with the wetland types on your Forest Practices activity map or have questions, contact your local DNR region office for assistance.

## 1

**DETERMINE THE WETLAND TYPES YOU HAVE**

Determine if you have wetland types that require protection. If so, identify which type. Wetland Management Zone (WMZ) buffers or other protection measures are required if you have any of the following:

See the Forest Practices Rules WAC 222-30-020 WAC 222-16-035 and Board Manual Section 8.

**TYPE 'A' WETLAND**

An area of 1/2 acre or more covered by open water seven consecutive days between April 1 and October 1. This includes forested and non-forested bogs that are greater than 1/4 acre.

**TYPE 'B' WETLAND**

An open area of 1/4 acre or more that is vegetated with water-tolerant plants and/or shrubs.

**FORESTED WETLAND**

A wetland with a tree crown closure of 30 percent or more, if trees are mature.

## 2 DETERMINE THE WETLAND MANAGEMENT ZONES (WMZ)

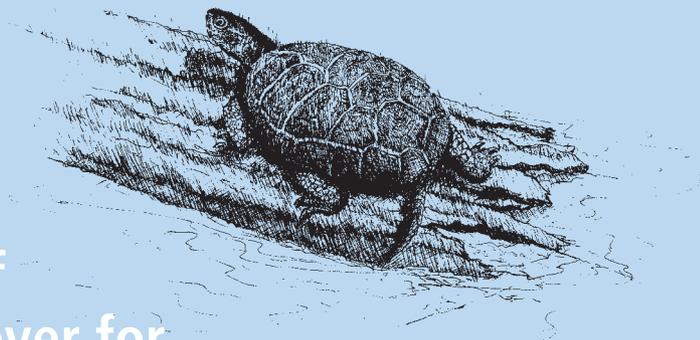
Wetland Management Zones in Eastern and Western Washington have variable widths, based on the size and type of the wetland.

Wetland Type	Acres of Non-Forested Wetland*	Maximum WMZ Width (feet)	Average WMZ Width (feet)	Minimum WMZ Width (feet)
A (including bogs*)	Greater than 5	200'	100'	50'
A (including bogs*)	0.5 to 5	100'	50'	25'
A (bogs only*)	0.25 – 0.5	100'	50'	25'
B	Greater than 5	100'	50'	25'
B	0.5 to 5	No WMZ Required	No WMZ Required	25'
B	0.25 to 0.5	No WMZ Required	No WMZ Required	No WMZ Required
Forested	No WMZ required. Low impact harvesting allowed. Additional restrictions apply. * For bogs, both forested and non-forested areas are included.			



See **Board Manual Section 8** for more information. Boundaries are measured from the edge of the wetland. Decide if you will be harvesting within a WMZ. If not, skip step 3 and read the Resource Protection section on page 96.

It is important to protect wetlands because they provide a mix of nutrients and cover for aquatic species and protect stream quality.



## 3

**CONDUCT A TREE INVENTORY WITHIN THE WETLAND MANAGEMENT ZONE (WMZ)**

Conduct a tree inventory to determine which trees can be harvested within the WMZ. The Forest Practices Rules establish leave tree requirements per acre.

You must leave 75 trees per acre, all of which must be greater than 6" DBH in Western Washington and 4" DBH in Eastern Washington. In addition, 25 of the 75 trees must be greater than 12" DBH and five must be greater than 20" DBH. To make determining your leave trees easier, use the following formulas for determining trees per 1,000 linear feet of WMZ.

The resulting numbers will be equivalent to the number and size of trees required per acre.


**TREES PER 1,000 LINEAR FEET  
OF WETLAND BOUNDARY  
WESTERN WASHINGTON**

	<b>100' Width WMZ: 172 Total Trees</b>	<b>50' Width WMZ: 86 Total Trees</b>	<b>25' Width WMZ: 43 Total Trees</b>
6" DBH	115	57	29
12" DBH	46	23	11
20" DBH	11	6	3


**TREES PER 1,000 LINEAR FEET  
OF WETLAND BOUNDARY  
EASTERN WASHINGTON**

	<b>100' Width WMZ: 172 Total Trees</b>	<b>50' Width WMZ: 86 Total Trees</b>	<b>25' Width WMZ: 43 Total Trees</b>
4" DBH	115	57	29
12" DBH	46	23	11
20" DBH	11	6	3



**Openings must be less than 100' wide, measured parallel to the wetland edge. Openings in the WMZ need to be more than 200' apart.**

Limited partial cuts or removal of small groups of trees within the WMZ may be allowed.

All measurements are taken horizontally, while keeping the measuring tape level at all times.



4

**MEASURE AND MARK YOUR WETLAND MANAGEMENT ZONE (WMZ)**

- ▶ All measurements are taken horizontally, while keeping the measuring tape level at all times.
- ▶ Tree diameter measurements are taken at “diameter at breast height” or DBH. This measurement is taken with a diameter tape at a height of 4.5 feet from the ground.
- ▶ Bright tree-marking ribbon or paint is recommended. Using a different color for road location from the color used on the WMZ or harvest boundary helps eliminate confusion.
- ▶ Marking the proposal on the ground is very important. Clear marking helps to eliminate resource and property damage and delays in application processing.



See the Board Manual Section 8.

## Resource Protection in the Wetland Management Zone (WMZ)

For best resource protection, retain your leave trees in the Wetland Management Zone.

And remember, ground-based equipment cannot be used within the minimum Wetland Management Zone without written permission from DNR. The minimum Wetland Management Zone width is dependent upon the type and size of the wetland.

**When WMZ and RMZ protections overlap, use the one that provides the most protection for the water resource.**



See Forest Practices Rules WAC 222-30 for more information on resource protection in wetlands.

Stream Type 'F'  
Riparian  
Management  
Zone Buffer  
Boundary

WETLAND

Stream  
Type 'F'  
RMZ Buffer  
Boundary

Wetland  
Management  
Zone Buffer  
Boundary

**When  
WMZ and RMZ  
protections  
overlap, use  
the one that  
provides the  
most protection  
for the water  
resource.**



# Suggestions for Success

The following list has suggestions to help you achieve management objectives while protecting long-term investments and public resources. These suggestions may exceed Forest Practices Rules.

- I have read the "Wetland Management Zones" section.
- Verify all wetland types within 200 feet of your harvest, including those on your neighbor's property (with the neighbor's permission).
- Determine if you will harvest within the WMZ:
  - ▶ **If the WMZ overlaps with an RMZ, you must leave whichever buffer provides the most protection for the water resource.**
- Identify and mark WMZ boundaries.
- Mark trees for removal within the WMZ.
- Avoid damage to wetland vegetation:
  - ▶ Fall trees away from water and the WMZs.
  - ▶ Use tree-length yarding where possible.
  - ▶ Lift the leading end of the logs during skidding and/or yarding.
- If you have a forested wetland, make sure those more than 3 acres in size have the boundaries marked on the ground and are shown on the activity map.
- If you have a Type A or B wetland, determine the acreage of the wetland and the WMZ width needed to protect the wetland.

- If in the process of building a road or landing, you fill or drain 1/2 acre or more of an individual wetland (forested, type A or type B) you must replace the wetland or designate other land as a substitution for that filled/draind wetland. Seeking assistance from a professional consulting forester for this activity is strongly encouraged.
  - Communicate management objectives to your logging operator.
  - Contact a consulting forester for assistance with WMZ layout.
  - Obtain all required permits from city, county, state, and federal agencies.



See the **Board Manual Section 8**

# Planning and Designing Harvest Units, Roads, and Skid Trails

**P**roper road placement and maintenance are important parts of harvest planning. Building and maintaining the right road in the right place at the right time protects soil, water, fish, amphibians, wildlife, and long-term productivity of the site. It also maximizes your investments in harvest operations. (For more information, see Roads chapter, page 35)

Design and locate skid trails and skidding operations to minimize soil disturbance. Disturbing the soil can result in erosion and soil compaction, which can affect the soil's ability to grow trees. Skidding equipment should be limited to designated skid trails. Skid trails should also be designed to avoid areas where soil can enter the stream. Planning and marking the harvest site boundaries in advance minimizes the area covered by skid trails and landings. Building more skid trails and landings than you need takes land out of production and may contribute to increased soil erosion.



Your forest roads, harvest unit, stream(s), wetland(s), and reserve trees need to be shown on your activity map.



Soil compaction and runoff can be reduced by properly placing skid trails and by harvesting during drier times of the year.



Place roads and skid trails away from your wildlife reserve trees for your safety. These high traffic areas can damage roots and bark, which can cause the tree to die and fall.



Damage to trees can be avoided through proper planning and hiring experienced contractors.

**Building and maintaining the right road in the right place at the right time protects soil, water, fish, amphibians, wildlife, and long-term productivity of the site.**



LANDING

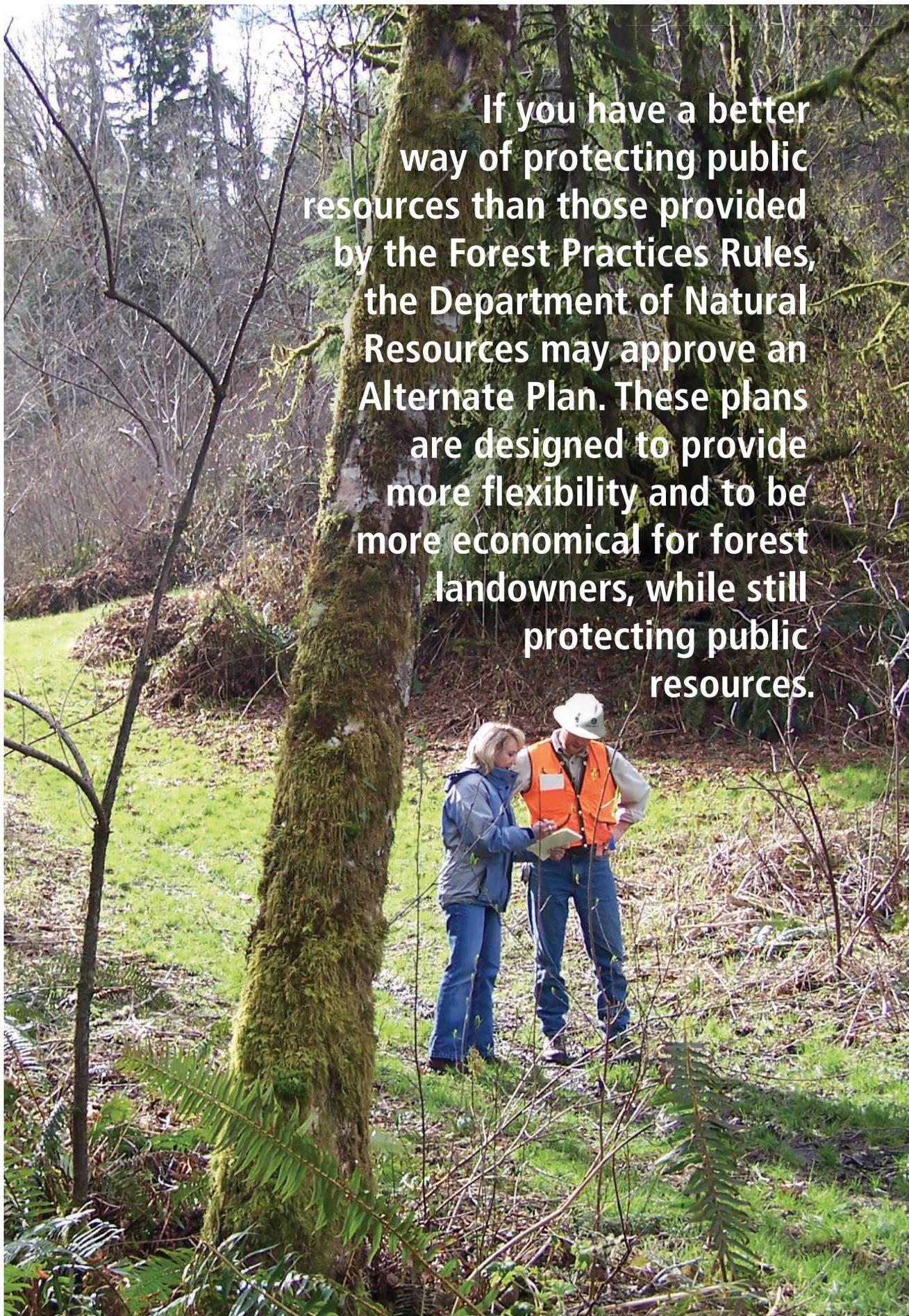


Consider what type of road surface you may need. Dirt for dry weather; rock for wet weather.



Place landings in locations that will easily drain water onto the forest floor.

If you have a better way of protecting public resources than those provided by the Forest Practices Rules, the Department of Natural Resources may approve an Alternate Plan. These plans are designed to provide more flexibility and to be more economical for forest landowners, while still protecting public resources.



# Planning Considerations

**Consulting foresters and forestry engineers can help you develop management plans, design timber harvest units and roads, contact loggers, and market your timber. A directory of consulting foresters is available from DNR and WSU Cooperative Extension offices. See the Resources section on page 136.**

## Site Conditions

- ▶ Topography
- ▶ Soil
- ▶ Water
- ▶ Wetlands
- ▶ Existing roads and future maintenance
- ▶ Forest health
- ▶ Forest stand type

## Economic Factors

- ▶ Short-term and long-term income needs
- ▶ Tax considerations (Contact Washington Department of Revenue for information: [dor.wa.gov/content/taxes/timber/default.aspx](http://dor.wa.gov/content/taxes/timber/default.aspx))
- ▶ Logging methods/water crossing structures and associated costs
- ▶ Markets

## Management Objectives

- ▶ Income from timber
- ▶ Fish and wildlife habitat
- ▶ Aesthetics
- ▶ Recreation
- ▶ Fire Protection
- ▶ Forest Health

## Resource Protection

- ▶ Public improvements, e.g., county roads, state highways, hatcheries, campgrounds
- ▶ Fish and wildlife habitat
- ▶ Threatened and endangered species' critical habitat
- ▶ Cultural, archaeological, and historical sites

- ▶ Municipal water sources
- ▶ Riparian Management Zones and Wetland Management Zones
- ▶ Wildlife Reserve Trees
- ▶ Green Recruitment Trees and down logs

## Timing of Operations

Harvest operations and water crossing work at the wrong time of year for the site can create problems, including:

- ▶ Soil compaction and erosion
- ▶ Excessive bark damage in the spring
- ▶ Disturbing fish and wildlife during crucial times in their life cycles
- ▶ Damaging roads and public resources
- ▶ Accumulation of pine slash in Eastern Washington from January to June creates prime habitat for bark beetles

## Do You Have a Better Idea?



**Submit an Alternate Plan** as part of an FPA/N for timber harvest to your local DNR region office. The plan must describe how the proposed alternative prescriptions depart from the Forest Practices Rules and how the proposal will provide resource protection which is equal to overall effectiveness to the forest practices rules. An application with an Alternate Plan may be submitted for either a three-year or a multi-year (five-year limit) period of time.

## Types of Wildlife Reserve Trees (WRTs) and Green Recruitment Trees (GRTs)



### TYPE 1 TREES

are live trees that are defective or deformed with sound tops, trunks, and roots



### TYPE 2 TREES

are dead trees with sound tops, trunks, and roots



### TYPE 3 TREES

are live or dead trees with unstable tops or upper portions



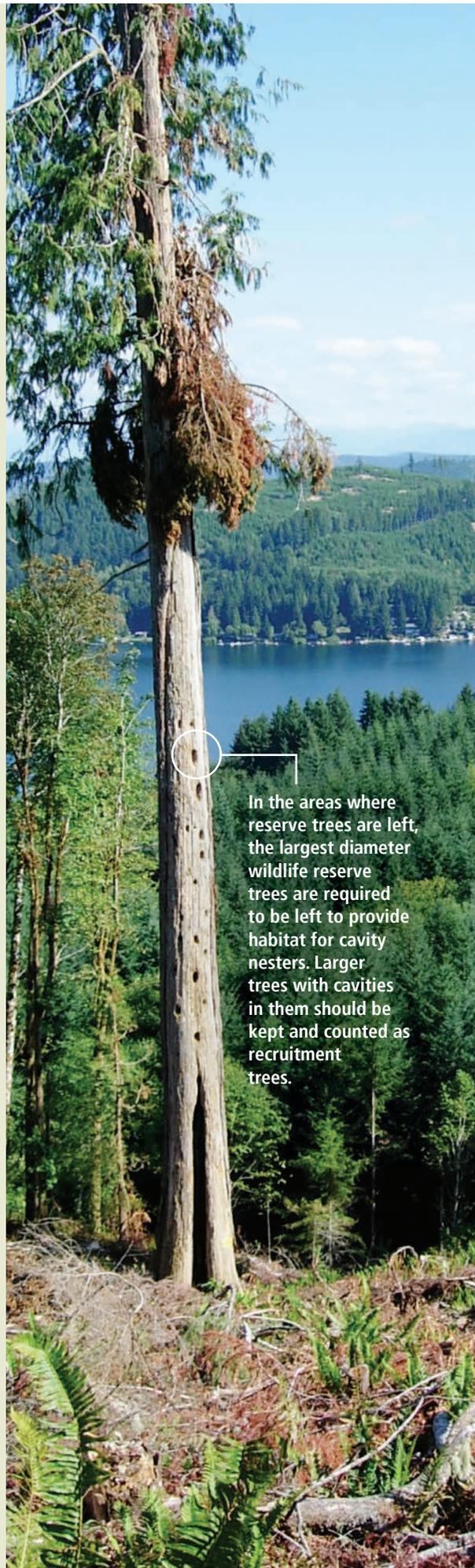
### TYPE 4 TREES

are live or dead with unstable trunks or roots; with or without bark

## Type 3 and Type 4 Wildlife Reserve Trees (WRTs) present significant safety considerations



It is best to leave these trees in Riparian Management Zones (RMZs) and Wetland Management Zones (WMZs) where minimum activity will take place near them. If you think a Wildlife Reserve Tree is a safety hazard, contact your local DNR region office and Department of Labor and Industries before you cut it down. Your personal safety is very important.



In the areas where reserve trees are left, the largest diameter wildlife reserve trees are required to be left to provide habitat for cavity nesters. Larger trees with cavities in them should be kept and counted as recruitment trees.

# Trees and Down Logs for Wildlife Habitat

**Landowners are required to leave a minimum number and size of trees and down logs to provide current and future wildlife habitat.**

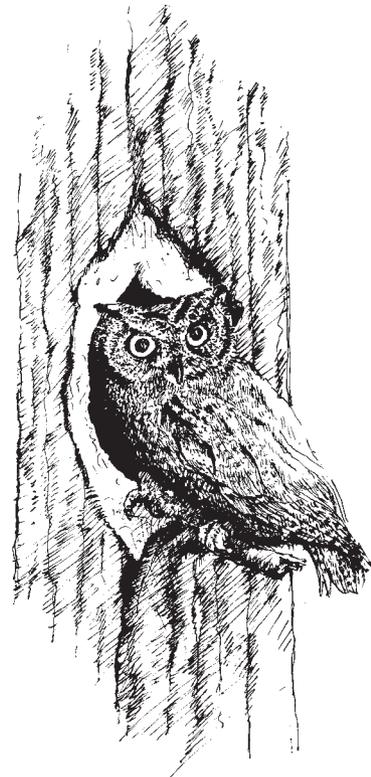
**D**ead, dying, live but deformed, and live trees are an important part of a healthy forest. They provide habitat for birds, mammals, amphibians, reptiles, insects, and a variety of plants.

More than 100 species of amphibians, mammals, and birds depend on down logs to meet at least some of their habitat needs. Some of those needs include nesting, overwintering sites, dens, roosting, foraging, and food storage. Some birds, such as sapsuckers and woodpeckers, excavate their own nests in snags (primary cavity nesters). Other birds occupy abandoned nests or natural cavities (secondary cavity nesters). Most cavity-nesting birds eat large quantities of insects each year. There is evidence that these birds eat so many insects that they keep populations of tree killing insects, such as bark beetles, below epidemic levels.

Squirrels and other small mammals use dying and dead trees as foraging sites, storing winter food supplies, and for roosting and denning. Bats use loose bark and hollow tree trunks for roosting. Numerous insects use dead trees as over-wintering sites; some eat portions of dead trees, contributing to the decomposition process.

The death and eventual falling of trees provide forest openings that encourage growth of vegetation and younger trees. This leads to improved habitat for species such as elk, deer, raptors, and small mammals.

Landowners are required to leave a minimum number and size of trees and down logs to provide current and future wildlife habitat.



## Minimum Requirements for Retaining Leave Trees and Down Logs

### WESTERN WASHINGTON



WILDLIFE TREE	# PER ACRE	MIN. HEIGHT	MIN. DIAMETER
Wildlife Reserve Tree	3	10 feet	12" DBH (diameter at breast height)
Down Log	2	20 feet	12" DBH at small end
Green Recruitment	2	30 feet with 1/3 live crown	10" DBH

### EASTERN WASHINGTON

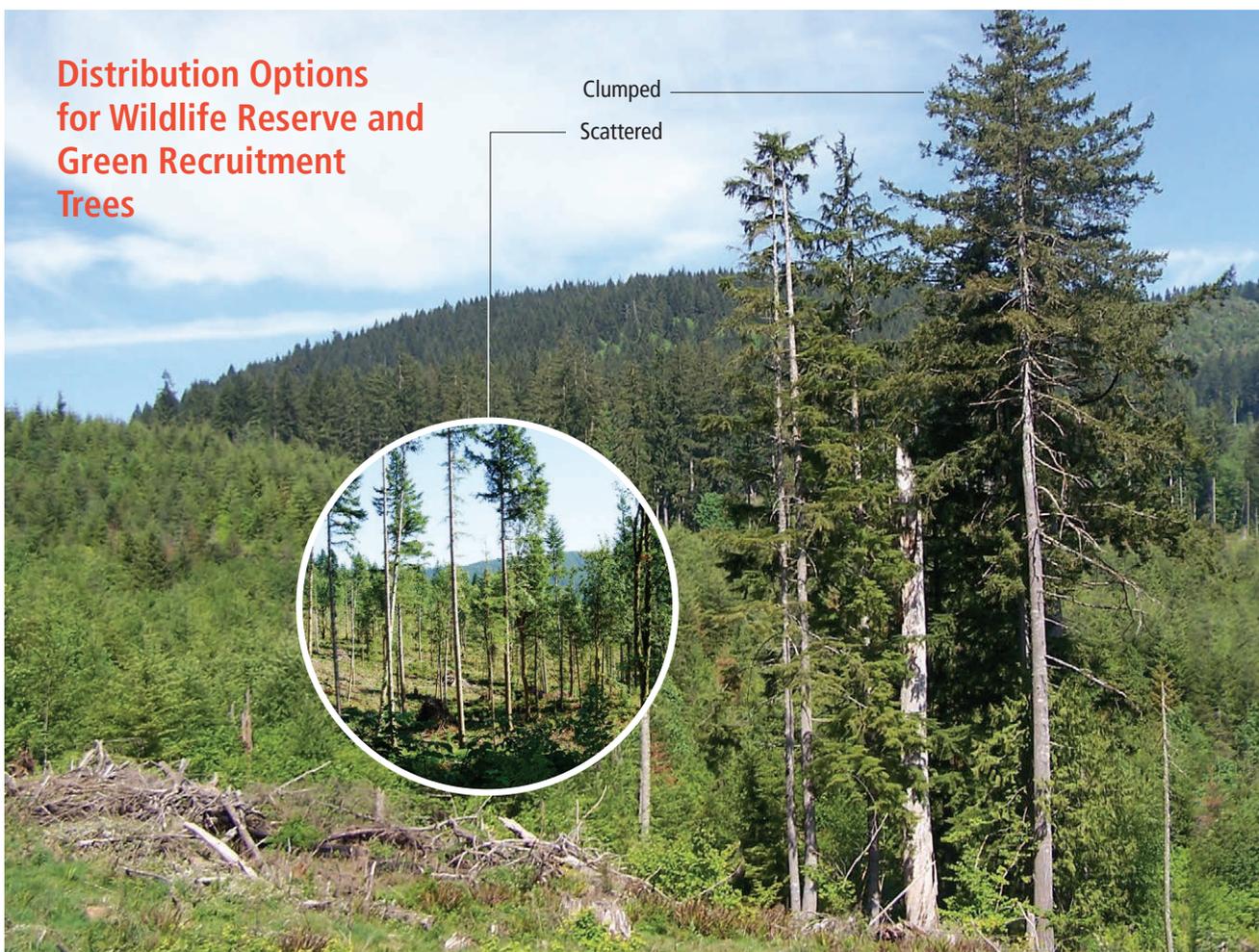


WILDLIFE TREE	# PER ACRE	MIN. HEIGHT	MIN. DIAMETER
Wildlife Reserve Tree	2	10 feet	10" DBH
Down Log	2	20 feet	12" DBH at small end
Green Recruitment	2	30 feet with 1/3 live crown	10" DBH



## Distribution Options for Wildlife Reserve and Green Recruitment Trees

Clumped  
Scattered





### What is DBH?

DBH is the cross-sectional area of a tree stem at 4.5 feet above the ground. Tree diameter is measured at 4.5 feet above the ground on the uphill size and is referred to as DBH (diameter at breast height).



$$DBH = \frac{\text{Circumference}}{3.14}$$

Amphibians, mammals, and birds depend on down logs to meet at least some of their habitat needs.

### Down Logs

The death and eventual falling of trees provides forest openings that encourage growth of vegetation and younger trees. This leads to improved habitat for species such as elk, deer, raptors, and small mammals.



# Threatened and Endangered Wildlife Species

**Some wildlife species are more sensitive to human activities than others. The federal government and Washington State have created measures to protect their habitat and hopefully increase their populations.**

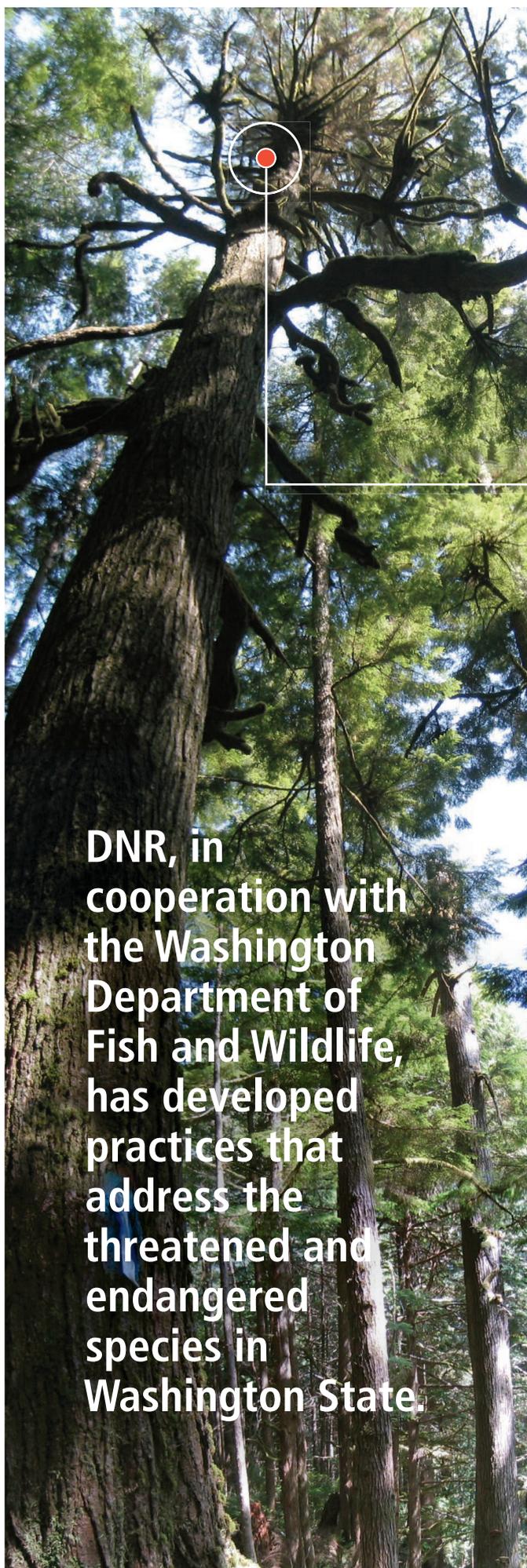
**T**he Federal Endangered Species Act was passed in 1973. An endangered species is one in danger of extinction and a threatened species is one likely to become endangered in the future.

The Forest Practices Board has adopted additional protection measures for certain threatened and endangered species.

As population increases and the demand for urbanization places pressure on wildlife habitat, it becomes crucial to protect the most sensitive of these species. DNR, in cooperation with the Washington Department of Fish and Wildlife, has developed practices that address the threatened and endangered species in Washington State.



When you submit your FPA/N, DNR will screen your activities to see if they impact any species' critical habitat as defined in WAC 222-16-080. If they do, DNR will contact you.



**DNR, in cooperation with the Washington Department of Fish and Wildlife, has developed practices that address the threatened and endangered species in Washington State.**



Western gray squirrel



Bald eagle



Lynx

## Threatened Wildlife Species in Washington State\*



**Marbled murrelet**  
makes its nest on large limbs of mature conifers.

- Aleutian Canada goose
- Bald eagle
- Ferruginous hawk
- Marbled murrelet**
- Western gray squirrel
- Mazama Pocket Gopher
- Green sea turtle
- Loggerhead sea turtle
- Lynx

**NOTE**  
Species marked in red are the species covered by Forest Practices Rules. Bald Eagles are protected under the Bald and Golden Eagle Protection Act, Federal Migratory Bird Treaty Act, and the Lacey Act.



Gray wolf



Northern Spotted owl



Oregon spotted frog

## Endangered Wildlife Species in Washington State\*

- Oregon spotted frog
- Taylor's Checkerspot Butterfly
- Sandhill crane**
- Upland sandpiper
- Northern Spotted owl**
- Pygmy rabbit
- Columbian white-tailed deer
- Western pond turtle**
- Woodland caribou**
- Gray wolf**
- Grizzly bear**



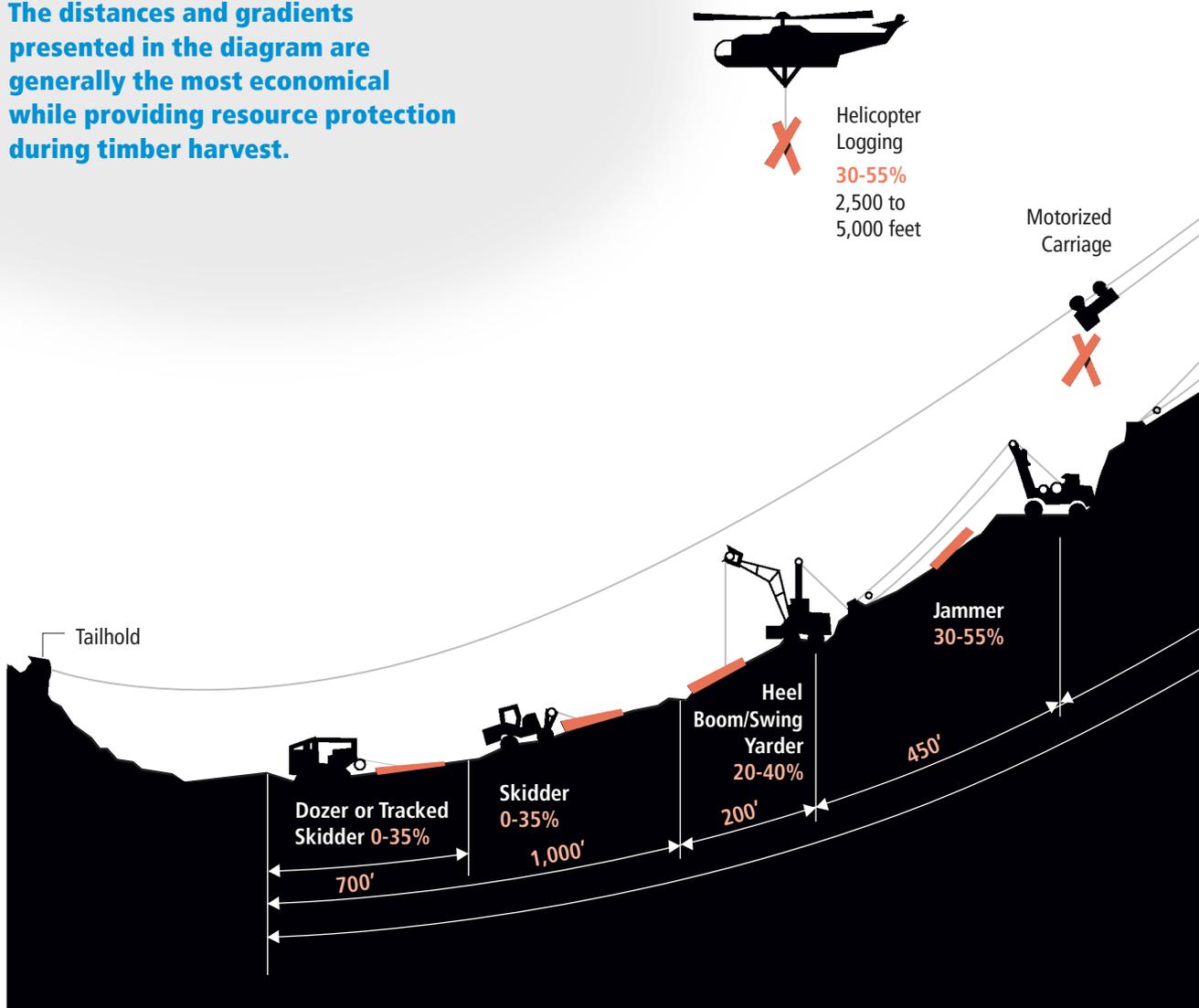
\* Partial List

WOODLAND CARIBOU ILLUSTRATION BY JANE CHAVEY; WESTERN GRAY SQUIRREL PHOTO: MARY LINDERS; LYNX AND GRAY WOLF: GERALD AND BUFF CORSI © CALIFORNIA ACADEMY OF SCIENCES; MARBLED MURRELET: THOMAS HAMER; OREGON SPOTTED FROG: WILLIAM LEONARD

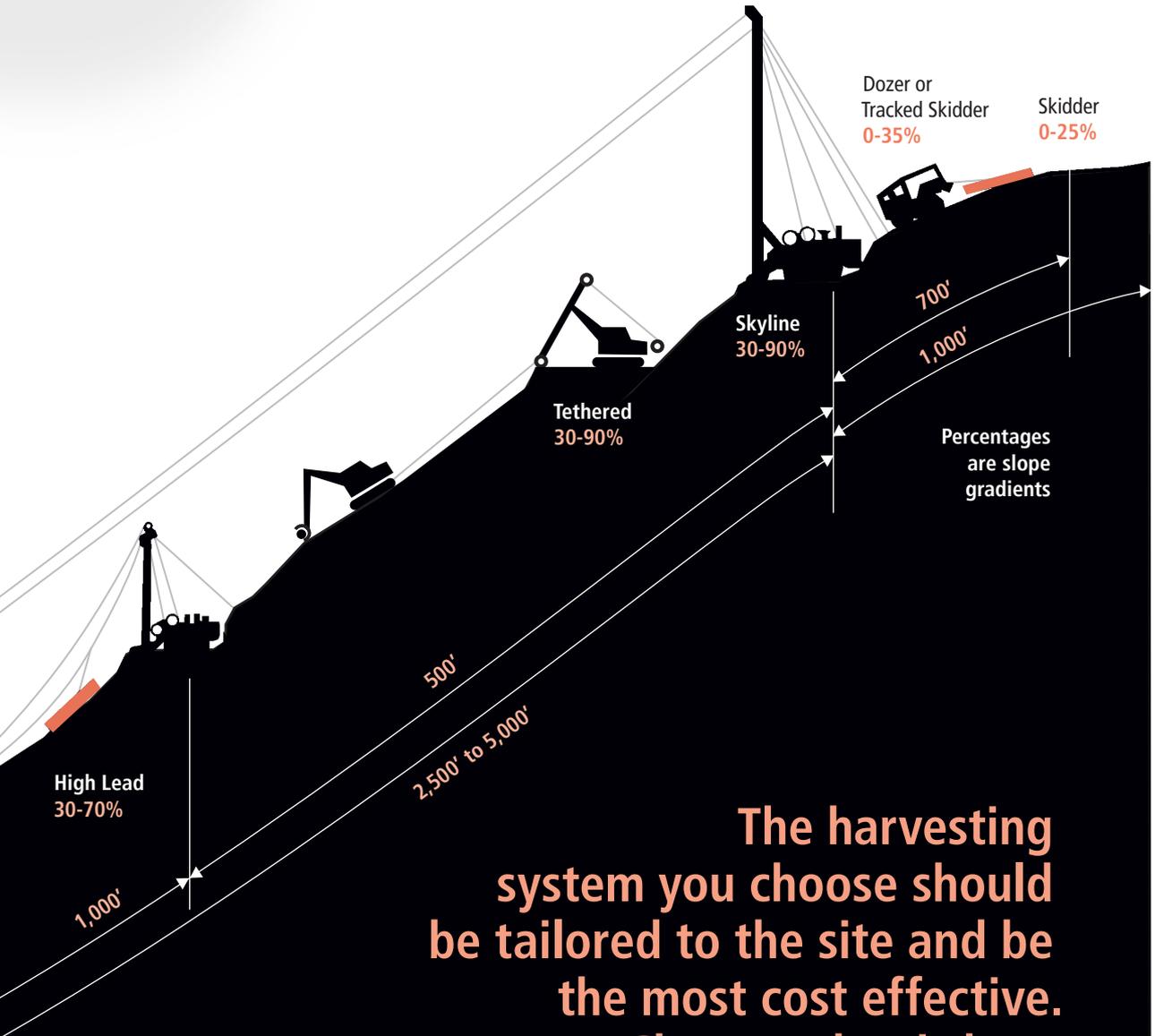
# Harvesting Systems

The harvesting system you choose will depend largely upon your particular site conditions. As this diagram shows, each machine can be combined with others to create the most advantageous harvesting system. There are advantages and disadvantages to each piece of equipment. Consult with a forester when choosing your harvesting system.

The distances and gradients presented in the diagram are generally the most economical while providing resource protection during timber harvest.



## Optimum Yarding Distances and Slope Percent of Logging Systems



The harvesting system you choose should be tailored to the site and be the most cost effective. Choose what is best for protecting soil, water, fish, amphibians, and wildlife.

## Ground-Based Harvesting Systems

The following ground-based harvesting systems are typically used on gentle terrain, on soils not easily compacted, and in areas with good road access. Ground-based systems are generally used on slopes less than 35 percent in Western Washington and less than 50 percent in Eastern Washington. Skidding distances are less than 700 feet in Western Washington and 1,300 feet in Eastern Washington. The harvesting system you choose should be tailored to the site to minimize any potential resource damage and be the most cost-effective. Choose what is best for protecting soil, water, fish, amphibians, and wildlife on your proposed harvest activities.

**The harvesting system you choose should be tailored to the site. Choose what is best for protecting soil, water, fish, amphibians, and wildlife.**



### Tethered Logging System

Tethered logging systems can enable ground-based timber harvesting machines to be operated on slopes of more than 50 percent.



### Horses

Good for smaller timber, partial harvesting on level ground in aesthetically or environmentally sensitive areas.





**Tracked Skidder (Dozer)**

Can operate on moderate slopes and perform multiple tasks. Tracked skidders are able to pull larger loads and work in softer soil with less compaction than rubber tired skidders.



**Rubber Tire Skidder**

Single task equipment (only pushes or pulls logs), is generally less expensive than tracked skidders, and is used for longer skidding distances. Rubber-tired skidders generally cause more soil disturbance and compaction than other types of skidding equipment.



**Fully Mechanized Harvesting System**

Performs entire process (cutting, forwarding, bucking, etc.) and requires fewer people to conduct a harvest operation. Typically compacts the ground less than skidders.



**Shovel**

May place less pressure on the ground than tracked and rubber tire skidders. Versatile equipment that operates well around Riparian Management Zones, leave trees, and across uneven surfaces (stumps, brush, etc.). Performs multiple tasks, such as site preparation, road construction, yarding, and culvert installation.

**Water Tank**

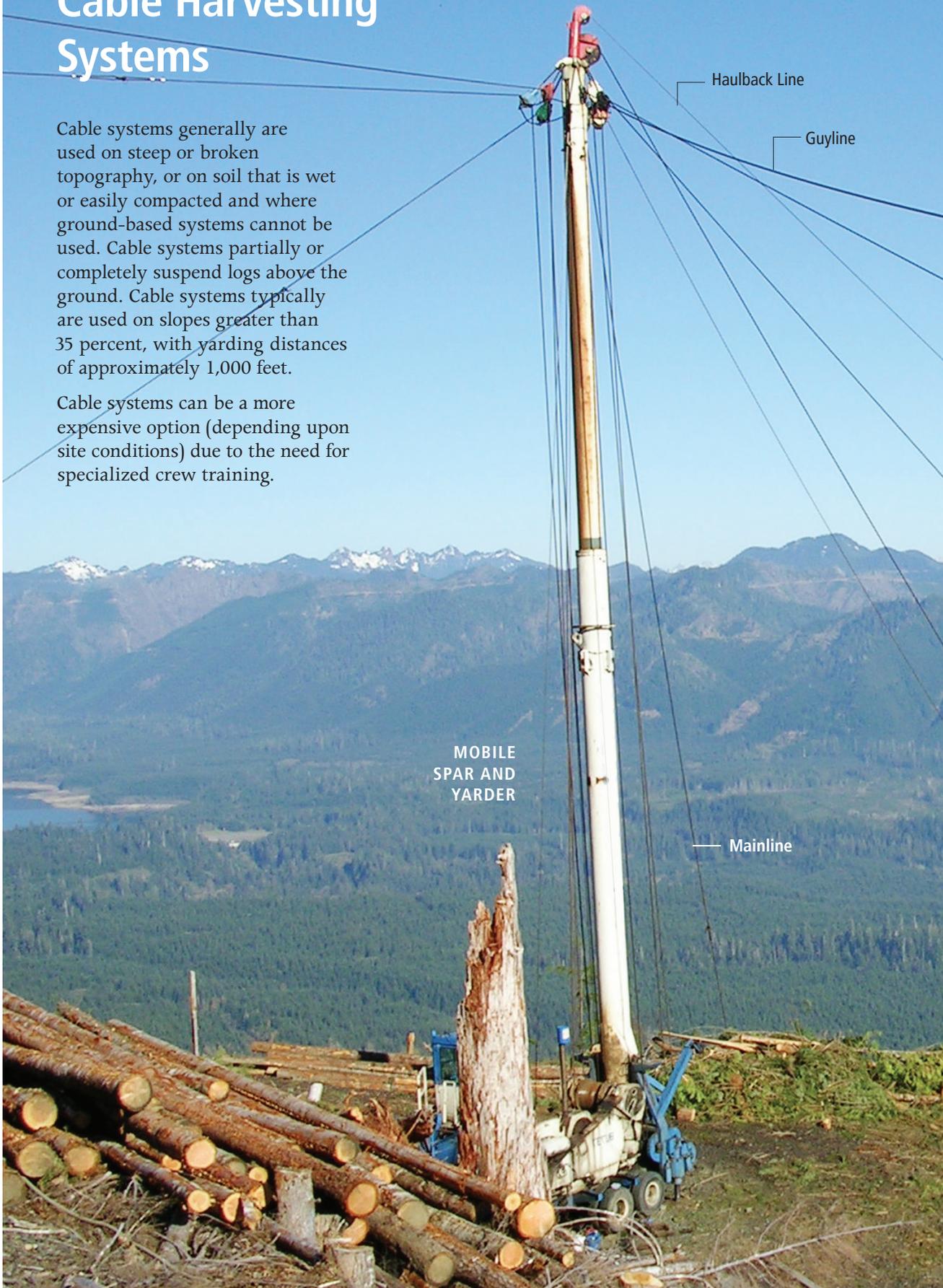
Maintain a water tank near logging operations between April 15-Oct 15. WAC 332-24-405



# Cable Harvesting Systems

Cable systems generally are used on steep or broken topography, or on soil that is wet or easily compacted and where ground-based systems cannot be used. Cable systems partially or completely suspend logs above the ground. Cable systems typically are used on slopes greater than 35 percent, with yarding distances of approximately 1,000 feet.

Cable systems can be a more expensive option (depending upon site conditions) due to the need for specialized crew training.



Cable systems typically are used on slopes greater than 35 percent, with yarding distances of approximately 1,000 feet.



### Helicopter Logging

Helicopter logging, while expensive, can be cost-effective in areas where the timber value is high and road construction is expensive or will have a negative environmental impact. Helicopter logging is typically used on slopes between 40-100 percent and have yarding distances up to 5,000 feet.

Helicopter logging is a good option for areas with sensitive features or in areas where roads are difficult to build.



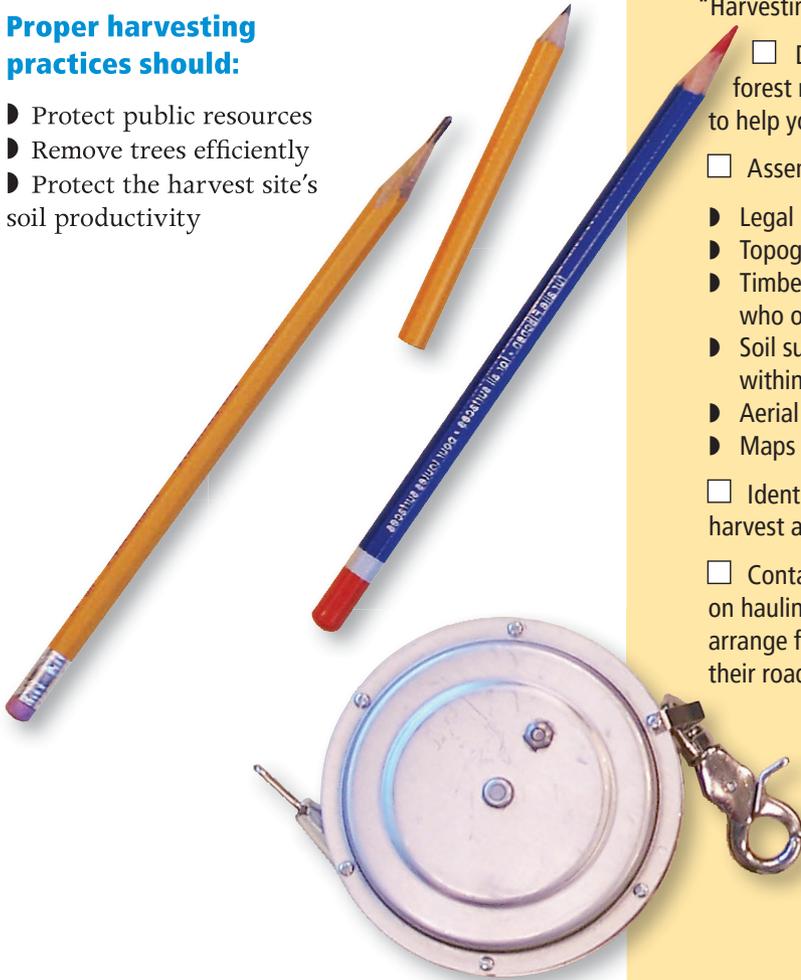
Maintain a water tank near logging operations between April 15-Oct 15.  
WAC 332-24-405

## Consider the Following When Planning Your Harvest

- ▶ What are the potential effects of this harvest on water quality?
- ▶ Where are the streams and wetlands located?
- ▶ Are there areas that will require special attention?
- ▶ How will the harvest affect fish and wildlife habitat?
- ▶ What kind (Douglas-fir, Western red cedar, etc.) of trees will be planted after harvest is completed and how soon after the harvest?

### Proper harvesting practices should:

- ▶ Protect public resources
- ▶ Remove trees efficiently
- ▶ Protect the harvest site's soil productivity



## Suggestions for Success

**The following list has suggestions to help you achieve management objectives while protecting long-term investments and public resources. These suggestions may exceed Forest Practices Rules.**

- I have read the "Planning and Designing Harvest Units, Roads and Skid Trails"; "Trees and Down Logs for Wildlife Habitat"; "Threatened and Endangered Species"; and "Harvesting Systems" sections.
  - Develop a written long-range forest management plan. DNR may be able to help you find assistance.
  - Assemble property information:
    - ▶ Legal description of your property
    - ▶ Topographic and stream type information
    - ▶ Timber rights, who owns the trees, who owns the land, etc.
    - ▶ Soil survey [if you are harvesting within the RMZ]
    - ▶ Aerial photos
    - ▶ Maps
  - Identify and mark property lines and harvest area boundaries.
  - Contact your neighbors if you plan on hauling the trees on their road and arrange for access and easement across their roads, if needed.
  - Plan harvest operations for the time of year most appropriate for the site.

- Plan roads, skid trails and landings that best fit the harvest system and terrain.
  - Identify areas needing protection:
    - ▶ Streams, wetlands, and sensitive sites
    - ▶ Green Recruitment Trees (GRTs) and Wildlife Reserve Trees (WRTs)
    - ▶ Areas identified as sensitive:
      - ▶ Unstable slopes
      - ▶ Archaeological, cultural, and historical sites
      - ▶ Drinking water supply
      - ▶ Threatened or endangered species' critical habitats
      - ▶ Seeps, springs, and headwaters
  - Consider what type of harvest is appropriate for your site: even-aged or uneven-aged. A consulting forester can help you decide what is best for your site.
  - Consider opportunities to enhance and restore fish and wildlife habitat:
    - ▶ Keep understory vegetation, where possible
    - ▶ Create snags from low quality trees
    - ▶ Clump GRTs around large snags
    - ▶ Locate WRTs and GRTs around springs, seeps, streams and wetlands
    - ▶ Leave no-cut buffers and the RMZ width required
    - ▶ Retain down logs and snags in excess of minimum required
    - ▶ Determine the largest living trees that will never be cut and leave them scattered across your harvest unit to provide habitat
  - Select harvest system appropriate for:
    - ▶ Soil conditions
    - ▶ Terrain
    - ▶ Season
    - ▶ Time available for completing operations
    - ▶ Size of harvest planned
    - ▶ Size of timber
- ▶ Type of harvest planned
  - ▶ Areas needing special protection
  - ▶ Minimal post-harvest site preparation
  - ▶ Availability of equipment
  - ▶ Skill level of operators
- Communicate your plans with neighboring landowners.
  - Find out if Watershed Analysis may affect your harvest plans (contact your local DNR region office for assistance).
  - Develop written contracts for loggers and obtain necessary permits from city, county, and state agencies (grading and hauling).
  - Contact a consulting forester for assistance with developing a management plan, marketing your timber, and finding a logger who can accomplish your management objectives. They may also help with developing an Alternate Plan, if needed.
  - If needed, consult with other agencies, Washington Tribal governments and professionals for advice on soils, fish, wildlife, historical, archaeological, and cultural sites.

# Reforestation

## TREE PLANTING

**Forest landowners play a key role in the life cycle of a forest. That cycle begins with planting trees and ends with harvest. Reforestation is the process of establishing a new forest either naturally by leaving seed trees or artificially by planting seedlings.**

**T**imely reforestation helps establish young trees so the area will not be overtaken by brush. Planting the harvest area with trees best suited to the site ensures your trees will grow into a strong and healthy forest.

Replanting trees after harvest is required, unless you are converting the land to a non-forest use such as a home site.

Several reforestation and harvest techniques can be used to help you achieve a new, healthy forest. Taking the time to become familiar with the practices used for growing trees in your area or seeking the advice of a professional forester will also help you achieve a healthy forest. It is best to evaluate and choose what type of reforestation technique and the type of harvest you want to do before you harvest your timber. Planning ahead will allow you to choose harvest methods that will help create favorable conditions for planting.

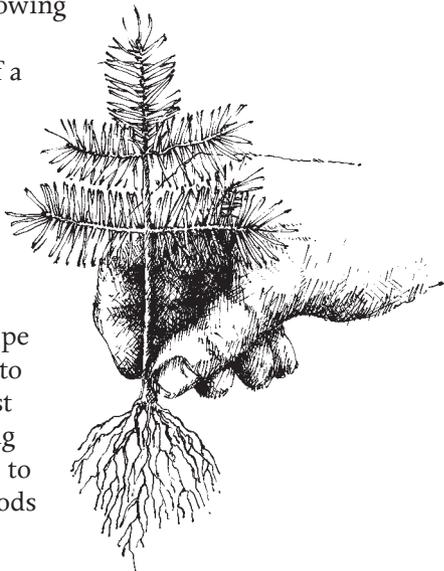


ILLUSTRATION BY JANE CHAVEY / DNR

Planning ahead will allow you to choose harvest methods that will help you create favorable conditions for planting.





Without the planting of seedlings, the 40-year old stand behind this plantation would look vastly different. The plantation below will look like this in 40 years and complete the forest cycle to possibly be harvested again.

40 year-old forest



## Site Preparation

**Site preparation is necessary if the harvest units are left in a condition unsuitable for planting or tree growth. Site preparation includes cutting whips (non-merchantable trees), piling slash, and scattering or burning slash.**

If good planting sites are available, no further preparation is necessary. Do not remove all the vegetation and slash as this can lead to browsing by rodents, deer and elk.

Take special care when using heavy equipment to prepare the site for planting. Trees need water and air for growth. Soil that is compressed can delay or prevent the growth of new trees. If the soil is packed too hard a planting shovel cannot dig into the soil to create a planting hole.

If burning is used for site preparation, you must follow the conditions of the permit. Slash burning requires a permit from DNR. The permit's conditions will include measures to protect:

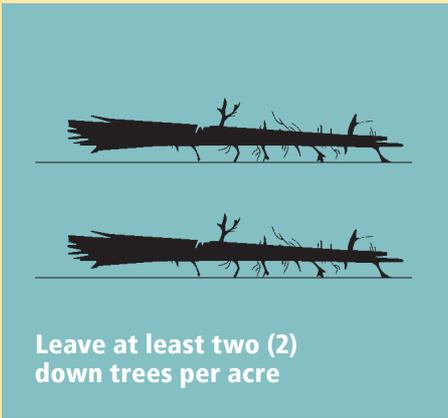
- ▶ Air quality
- ▶ Threatened and endangered species
- ▶ Other property

**Soil compaction can delay or even eliminate the start of the next forest. Heavy equipment can squeeze the soil pores, reducing the space for water and air.**



### Site Preparation

It is best to plant as soon as possible following harvest. If you wait, you may have large amounts of competing vegetation.



# Suggestions for Success

The following list has suggestions to help you achieve management objectives while protecting long-term investments and public resources. These suggestions may exceed Forest Practices Rules.

- I have read the previous page on "Site Preparation."
- Minimize soil disturbance when using mechanical equipment.
- Use the proper amount and type of site preparation for replanting.
- Leave at least two (2) down trees per acre.
- Specify in the logging contract the person or company responsible for site preparation so the site is prepared for planting tree seedlings.
- Slash piles are not allowed in the RMZ or WMZ. Place all slash piles above the 100-year flood plain.
- Slash burning is not allowed in the RMZ or WMZ. Slash burning requires a burn permit from DNR. Contact your local DNR region office for permit information.
- If using herbicides, refer to the chemical section on page 128.
- If you have slash or slash piles within 100 feet of a public road or within 500 feet of a structure, contact your local DNR region office. You may have an extreme fire hazard which must be mitigated.
- If needed, consult your local DNR region office or a forestry consultant.

# Reforestation Requirements and Information

## There are two main types of reforestation:

- ▶ Planting
- ▶ Natural regeneration

If you are required to reforest, you will need to choose either tree planting or natural regeneration. Natural regeneration relies on leave trees as the seed source. If you choose natural regeneration, you must submit a natural regeneration plan with your FPA/N.

## You do not have to reforest when:

- ▶ You state on your FPA/N that you are converting your forest land to a use other than growing timber within three years. Reforestation is required if conversion is not completed.
- ▶ Your leave trees are considered an established stand. Established means the trees are well distributed, undamaged, vigorous saplings and/or merchantable trees that have survived at least one growing season.



### WESTERN WASHINGTON

#### WITHIN THREE YEARS OF HARVEST

At least 190 trees per acre must be established.



### EASTERN WASHINGTON

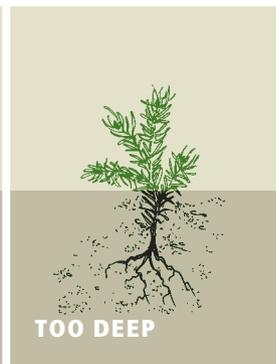
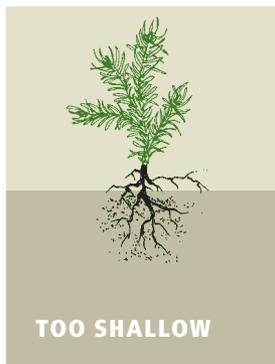
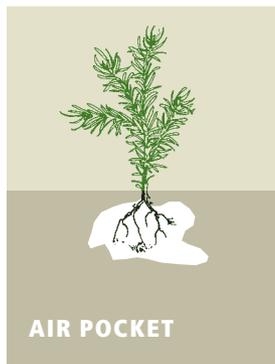
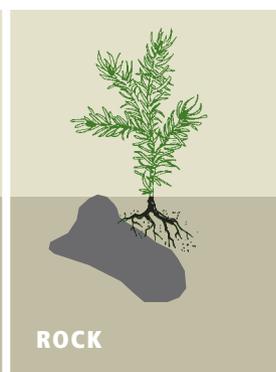
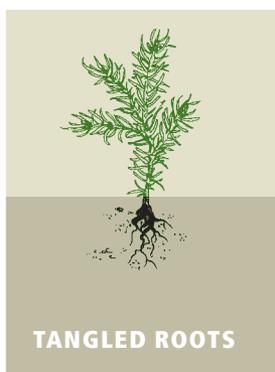
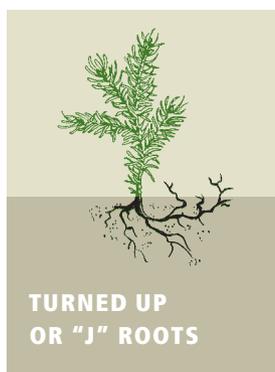
#### WITHIN THREE YEARS OF HARVEST

At least 150 trees per acre must be established.

## Correct



## Planting Errors



# Things to Consider Before Planting

**Seedlings should be planted on cool or cloudy days with little to no wind. If freezing or snow conditions have occurred, wait until the snow has receded and the ground has thawed before planting.**

- ▶ Minimize soil disturbance when using mechanical equipment.
- ▶ Determine your site's seed zone and elevation to order the appropriate seedlings for your site.
- ▶ Choose the best seedling size for your site condition.
- ▶ Consider the amount of competing vegetation you may have.
- ▶ Determine your soil type and its drainage.
- ▶ Consider choosing a species that is not sensitive to frost.
- ▶ Take into account the amount of sunlight and shade your trees will receive.
- ▶ Research how to best protect your seedlings from damage by livestock and wildlife.



**CORRECT**  
Place seedlings in pail or planting bag, keeping roots covered with wet burlap, peat moss or similar moist material.



**INCORRECT**  
Do not carry seedlings in your hand. If exposed to the air for even a short time, tiny roots will dry out and cause the tree to die.

**Seedlings are living things and should be handled carefully. For highest survival rate, plant them immediately.**





- A.** Douglas-fir seedlings appear "bushy" when repeatedly browsed by livestock, elk, and deer.
- B.** Bottom of seedling bark stripped by rodents.
- C.** Bud caps and placing netting around seedlings can help reduce mortality due to browsing.

## Allow for Loss of Trees

Planting more trees than required by the Forest Practices Rules allows for the loss of trees due to disease, animals, and improper planting. To help seedlings receive adequate light, water, and nutrients make sure they are evenly spaced throughout the site.

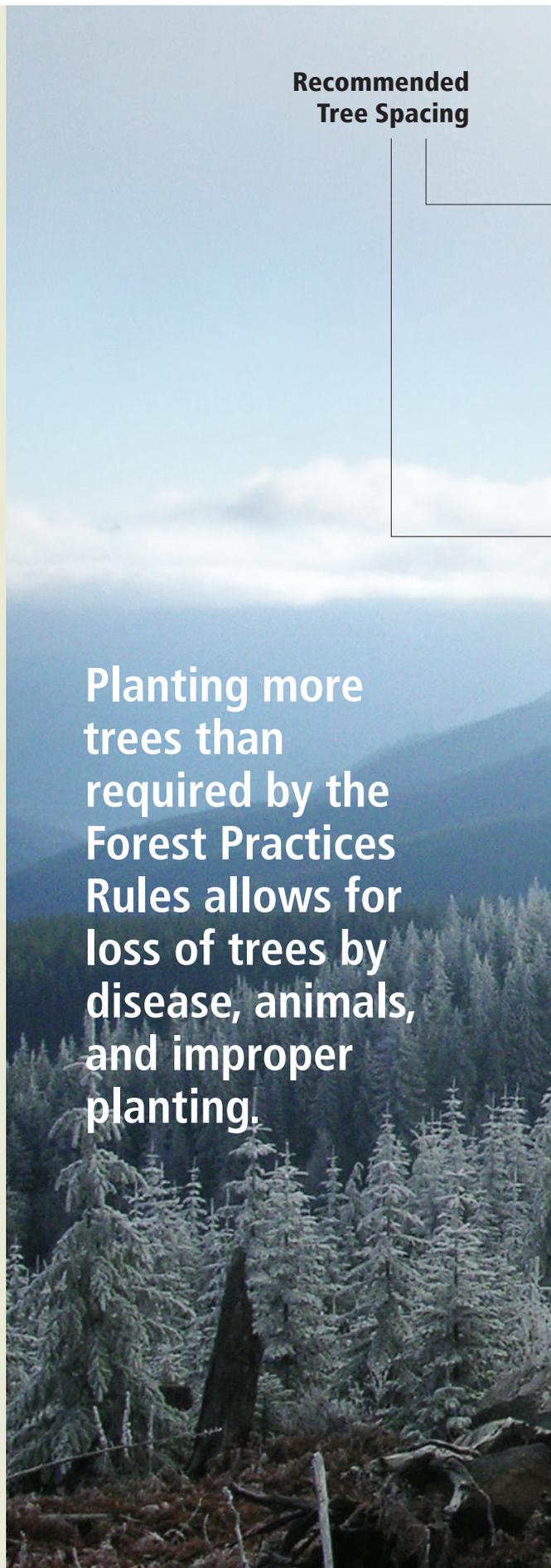
The spacing guide below shows the distance between each tree to achieve the desired number of trees per acre.

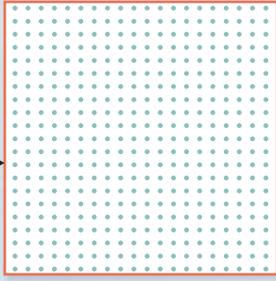
PLANTING DISTANCE BETWEEN TREES	TREES PLANTED PER ACRE
17 feet X 17 feet	150 trees <b>FPA RULE*</b>
15 feet X 15 feet	190 trees <b>FPA RULE*</b>
13 feet X 13 feet	258 trees
12 feet X 12 feet	303 trees
10 feet X 10 feet	431 trees
8 feet X 8 feet	681 trees

\*Minimum number of healthy trees remaining after first growing season. Plan for mortality.

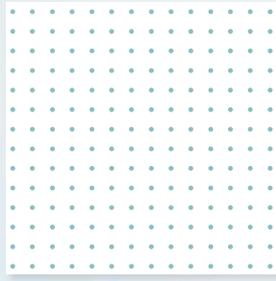
### Recommended Tree Spacing

Planting more trees than required by the Forest Practices Rules allows for loss of trees by disease, animals, and improper planting.



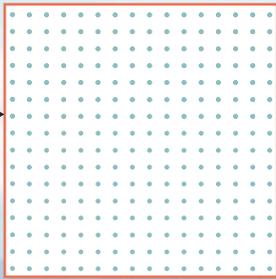
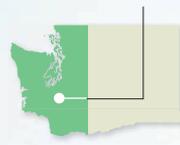


**431 Trees/Acre**  
Distance between trees  
10 x 10 feet

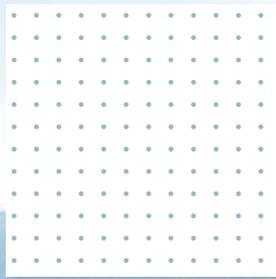


**190 Trees/Acre**  
Distance between trees  
15 x 15 feet

WESTERN WASHINGTON

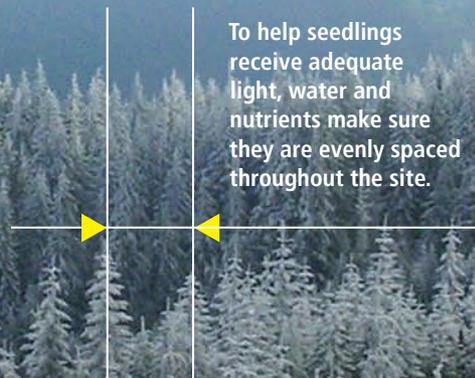
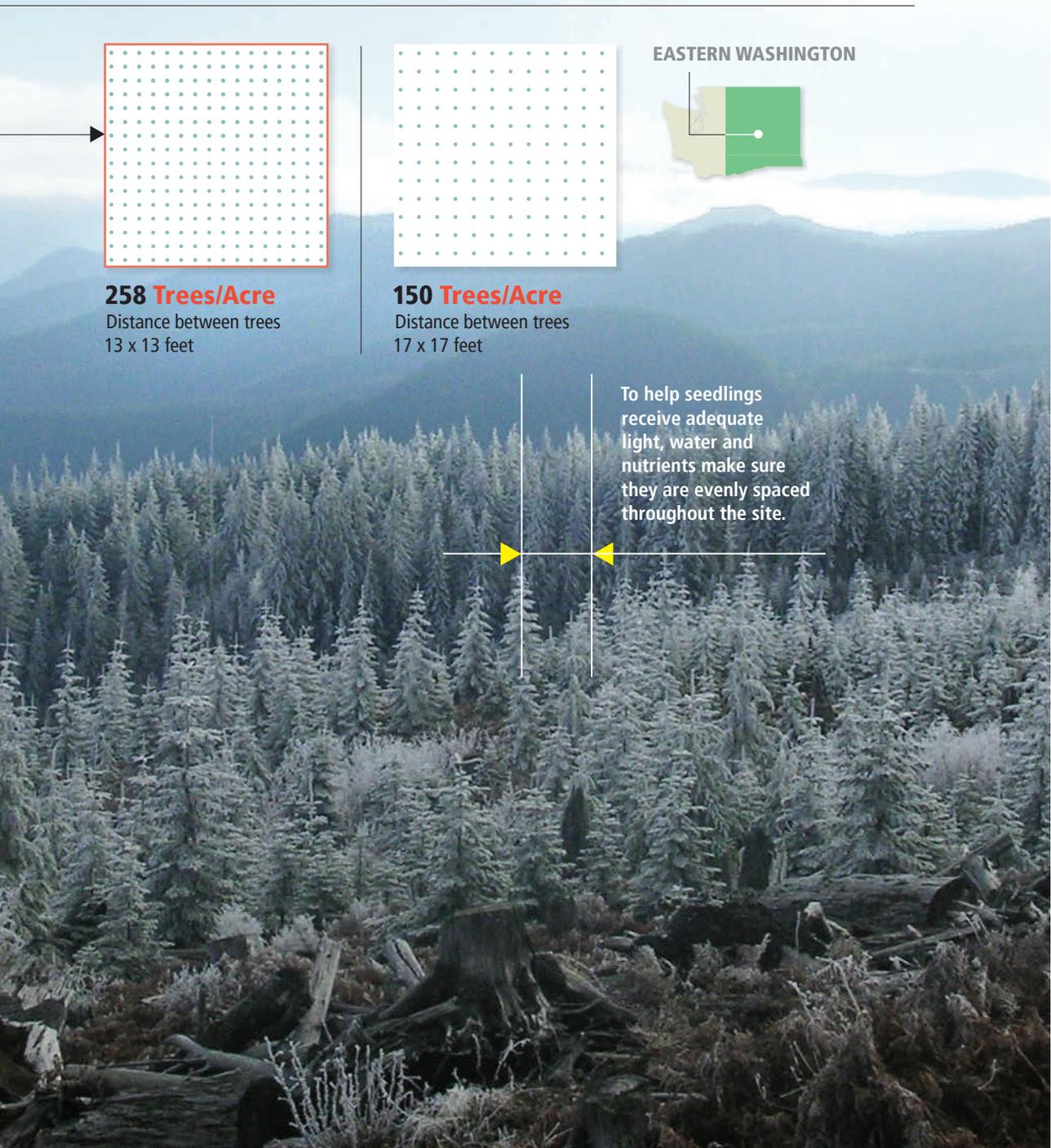
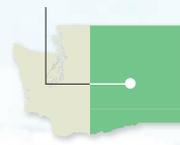


**258 Trees/Acre**  
Distance between trees  
13 x 13 feet



**150 Trees/Acre**  
Distance between trees  
17 x 17 feet

EASTERN WASHINGTON



To help seedlings receive adequate light, water and nutrients make sure they are evenly spaced throughout the site.

## STEPS FOR CORRECT TREE PLANTING

### Planting With Shovel



Insert shovel vertically with blade reversed, push handle away from you, then pull soil back and out of the hole.



Hold soil back with shovel and insert tree at proper depth, making sure roots are not bent.



Cover the roots and pack soil by stepping firmly around the roots. The sooner seedlings are planted, the sooner growth starts. Never plant in frozen ground or during freezing temperatures.

### Planting With Hoe/Adze



Insert hoe and loosen soil.



Pull toward you.



Insert tree at proper depth, making sure roots are not bent.



Cover roots to base.



Pack soil by stepping firmly around the roots.



Tree is planted correctly.

# Suggestions for Success

**The following list has suggestions to help you achieve management objectives while protecting long-term investments and public resources. These suggestions may exceed Forest Practices Rules.**

- I have read the "Reforestation" section.
  - Before harvesting, identify who is responsible (the logger or the landowner) for purchasing and planting seedlings. Include this in your logging agreement.
  - Consider hiring a planting contractor or add this to your logging contract. It is beneficial to work with contractors that do this work on a routine basis. They will be able to assist with successful reforestation of your site.
  - Contact the tree nursery and find out how much advance notice is required to order the seedlings (known as a sowing request). For certain tree seedlings, sowing requests need to be made two to three years before planting. WSU extension has a list of nurseries at [http://forestry.wsu.edu/wp-content/uploads/Forestry\\_Supplies.pdf](http://forestry.wsu.edu/wp-content/uploads/Forestry_Supplies.pdf).
  - Reforest during the first planting season after harvest. This will help trees outgrow competing vegetation. If this is not possible, make sure to reforest no later than the second planting season after harvest.
- Western Washington**  
Typically between January and April.
- Eastern Washington**  
Typically between March and May, or as soon as the snow has receded.
- Control unwanted vegetation.
  - Plans for natural regeneration (using leave trees as seed sources) must be submitted with the FPA/N for timber harvest. The plan should include your seed source and whether you will be scarifying the land.
  - Generally, plant no less than 300 evenly spaced trees per acre to account for mortality.
- Order trees one to two years before the spring planting season to ensure best selection of seedlings.
  - Choose trees that are well adapted to the site conditions:
    - ▶ Elevation
    - ▶ Precipitation
    - ▶ Aspect — does the slope face north, south, east, or west
    - ▶ Site preparation
    - ▶ Types of disease and insects
  - Consider replanting species different than those harvested if another species:
    - ▶ Is better suited to site conditions
    - ▶ Is less susceptible to forest health problems
    - ▶ Has greater economic potential
  - Use proper seedling storage, handling, and planting procedures. Install animal damage protective devices if necessary.
  - Check trees yearly and if necessary
    - ▶ Replant
    - ▶ Protect against animal damage
    - ▶ Control competing vegetation
  - If needed, contact a consulting forester for more information.
- Please refer to the Resource section on page 140 for additional information on how to obtain pamphlets for guidance on reforestation.



# Plantation Maintenance

**Plantation maintenance is an important component of a healthy and productive forest. Maintenance is the general term used for activities involving site preparation, planting, and controlling competing vegetation and pest species.**

There are several ways to maintain, protect, and enhance forest productivity through mechanical or chemical methods. As a landowner, you will need to decide what type and level of management is appropriate to meet your needs. In some cases, the most cost-effective management tool is to do nothing at all. Although this section describes some mechanical maintenance, the focus is on forest chemicals and precautions needed for that particular activity.

The three state agencies that regulate the use of forest chemicals are the Department of Natural Resources (DNR), the Department of Agriculture (WSDA), and the Department of Ecology (ECY).



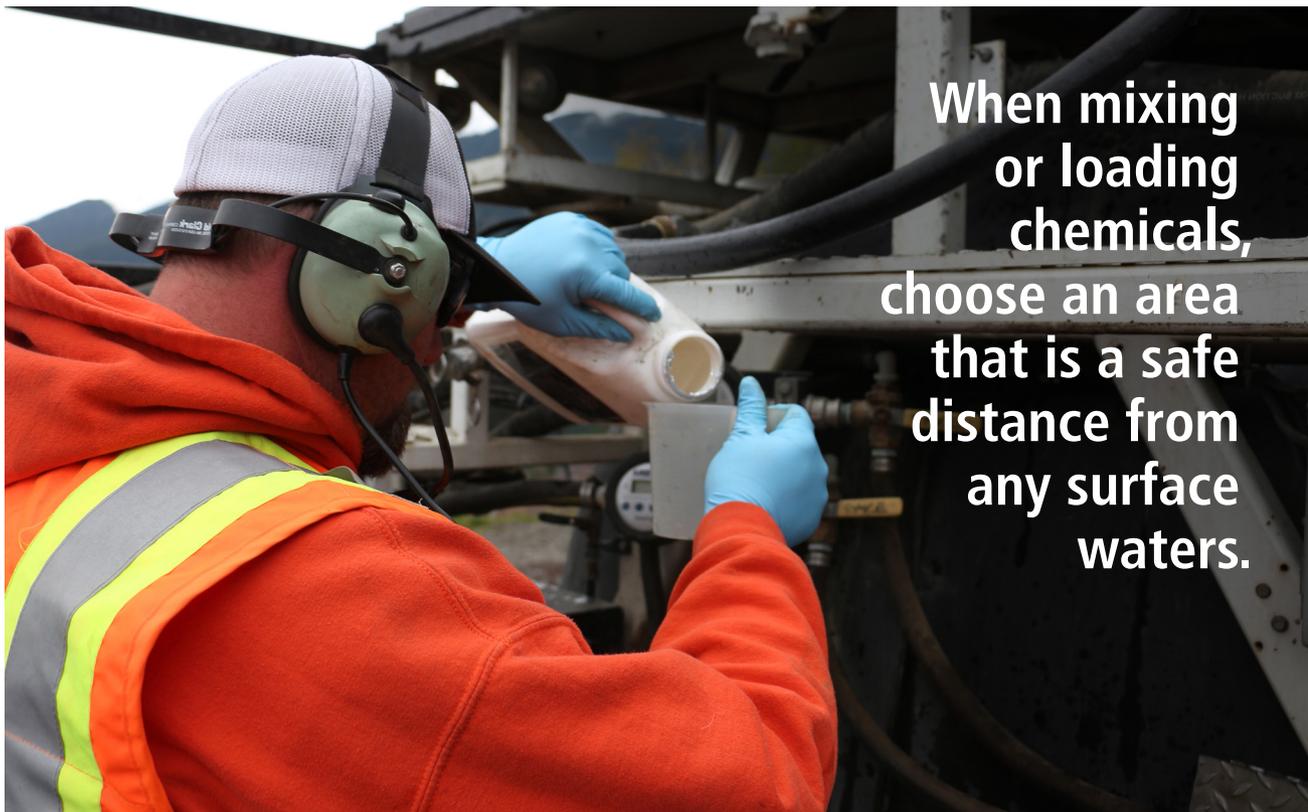
Pruning helps trees grow faster by allowing nutrients to get to the uppermost part of the tree and it can reduce the occurrence of knots.

**As a landowner, you will need to decide what type and level of management is appropriate to meet your needs.**



## Mechanical Maintenance

WHAT IS IT?	TECHNIQUE	MOST EFFECTIVE ON
<p>Mechanical maintenance is a common practice when managing timberlands. Using tools and machines to control competing vegetation, scarify soils for planting, and remove breeding habitat for insects and pests can be labor intensive. When deciding which maintenance method to use, consider how much acreage needs to be treated, the frequency of treatment (how often you will need to visit the site before seedlings/ saplings are well established), and the species being treated. Some competing plant and tree species are very aggressive and will require more intensive treatment to eradicate them.</p>	<b>MOWING OR GRAZING</b>	Grasses, forbs and herbaceous weeds
	<b>GRUBBING AND PULLING</b>	Completely removing roots
	<b>PLANTING COVER CROP</b>	Preventing competing vegetation from becoming established
	<b>HAND CUTTING</b>	Larger woody vegetation such as elderberry, big leaf maple, cherry, and alder trees



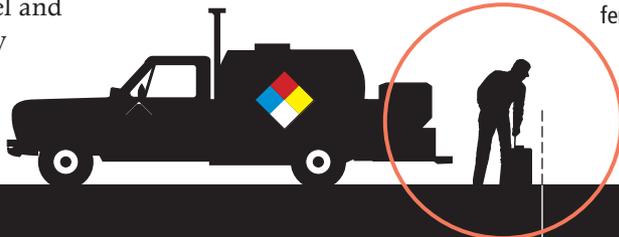
When mixing or loading chemicals, choose an area that is a safe distance from any surface waters.

## Pesticide Use

### INCLUDING HERBICIDE AND FERTILIZER

Pesticides, when applied appropriately, are useful management tools for landowners. These chemicals have a range of uses from controlling competing vegetation to fertilizing trees to improve growth. Other uses for chemicals include: controlling noxious weeds and invasive species, controlling insects and diseases, minimizing wildlife damage, maintaining rights of ways, and preparing sites for planting.

These products are regulated and the law requires users to follow all instructions on the label and not use or mix near any surface waters.



### Storage, Mixing and Chemical Loading Areas



When mixing or loading chemicals, choose an area that is a safe distance from any surface waters. This will prevent the release of chemicals from accidental spills into streams or wetlands.

Storage and cleaning areas should be located where spillage of chemicals or water used to clean equipment will not enter streams or wetlands. Recommend all of these areas should be a minimum of 25 ft always follow the specific label requirements for the herbicide or fertilizer being used.

### Prevent Forest Chemicals From Entering Water

Locate mixing and loading areas at least 25 ft away from the bankfull width where any accidental spills will not enter water or wetlands. Be sure to remove all empty chemical containers from the site for proper disposal.



#### Recommend a minimum

- Buffer requirements can vary based on stream type and application method.



### Use Best Practices Before, During, and After Applying Pesticides

Proper gear and cleanup after chemical applications are very important to your safety. They prevent the unwitting transfer of pesticides to your home and family. Product labels may change, so you must read the label each time, before you apply. Follow label directions and properly:

- ▶ Store, transport, mix, load, and apply chemicals
- ▶ Clean tanks and containers
- ▶ Remove containers from site
- ▶ Dispose of containers and remaining chemicals
- ▶ Adhere to both state and federal worker protection standards.
- ▶ Prepare for and handle emergency spills.

Variety of gear is shown for illustration purposes. Always refer to chemical label for PPE requirements.

**READ AND FOLLOW LABEL DIRECTIONS. THE LABEL IS THE LAW.**



After chemical application, remove shoes before entering home. Wash hands and shower. Wash all clothes in a separate load.

## GUIDELINES FOR FOREST CHEMICAL APPLICATION

Contact your local DNR region office while planning your spray project. Only aerial applications require an FPA/N, but region staff can help answer questions for all applications. You will need to know the following:

- ▶ If you will be spraying with ground equipment or with an aircraft (aerial, FPA/N required).
- ▶ The number of acres you will be spraying.
- ▶ The location of the spray project (section, township, and range).
- ▶ The boundaries of the spray project.
- ▶ Information about all chemicals to be used; their EPA numbers and all active ingredients (the chemical names, such as Triclopyr or Glyphosate).

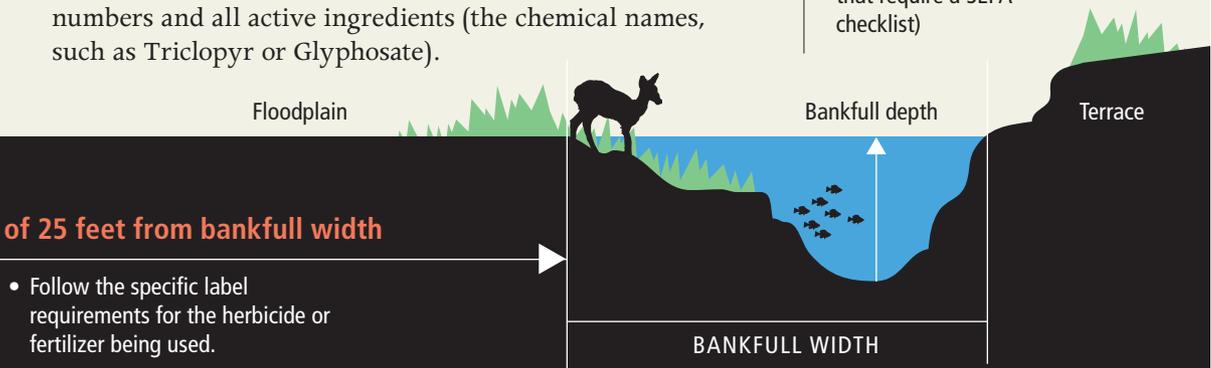


### FOREST PRACTICES APPLICATION HINT

Your local DNR region office will tell you if you need an FPA/N and if you need a State Environmental Policy Act (SEPA) environmental checklist. There is no fee for a chemical application FPA/N. See the following for more information:

Aerial Chemical FPA/N application and instructions

WAC 222-16-070 (pesticides that require a SEPA checklist)



of 25 feet from bankfull width

- Follow the specific label requirements for the herbicide or fertilizer being used.



Ground application of pesticides with power equipment is prohibited in the core zone, inner zone, or channel migration zone of any Type S and F streams unless necessary to meet requirements for noxious weed control.



**KEEP CHEMICALS  
OUT OF ALL  
SURFACE WATER**

Mark the stream crossings before spraying so the operator can see and avoid them.



## Motorized Ground Application

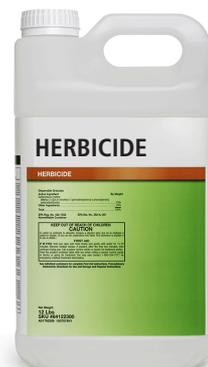
Ground application of pesticides with power equipment is prohibited in the core zone, inner zone, or channel migration zone of any Type S and F streams — unless necessary for noxious weed control. See WAC 222-38-020(5) for other requirements.

- ▶ Follow all label requirements
- ▶ Leave a 25 ft buffer along Type A and Type B Wetlands and on all sides of flowing Type N streams
- ▶ We strongly encourage you to notify your neighbors prior to application



## Hand Application

- ▶ Follow all label requirements
- ▶ Prohibited in the core zone, inner zone, or channel migration zone of any Type S and F streams unless necessary to meet requirements for noxious weed control
- ▶ We strongly encourage you to notify your neighbors prior to application



**FOLLOW  
ALL LABEL  
REQUIREMENTS**

To minimize drift, spray applications should be made when wind speed is less than 7 mph.

SPRAY WHEN WIND SPEED IS LESS THAN **7 MPH**

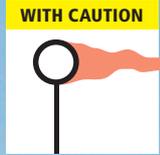
**FOLLOW CHEMICAL LABEL DIRECTIONS**



**1 MPH**  
Smoke rises vertically. No foliage movement.



**1-7 MPH**  
Foliage and small twigs sway gently. Grass and weeds sway and bend.



**7 MPH and Above**  
Small trees in open sway gently, loose scraps of paper move, small flags flutter, you feel a slight breeze on your face.

**OTHER WEATHER CONSIDERATIONS**

Wind speeds are irrelevant without taking into account other factors such as wind direction, heat and temperature inversions. Incidents of pesticide drift have happened during inversion conditions. Often when wind is stagnant—no wind or wind speed less than 3 MPH. That’s a clue to check for other inversion conditions.



# Aerial Application

- ▶ Follow all label requirements
- ▶ The first pass of each application should be made parallel to the buffer zones — but chemicals must not drift into the buffers
- ▶ Leave at least a 100 ft buffer next to agricultural lands from edge of farm field (unless label requirements specify wider)
- ▶ Leave at least a 200 ft buffer around homes (buildings where people live) unless label requirements specify wider
- ▶ Flag the buffers well and inform the pilot what color of flagging you have used
- ▶ We strongly encourage you to notify your neighbors prior to application
- ▶ It is illegal to allow pesticides to drift from the intended target or to apply to land without permission

**IMPORTANT**

Posting signs is required for aerial spraying. Five days prior to spraying, post signs at all places where people might enter the area. Leave signs posted at least 15 days after application. Signs must include the product name, date of treatment, a contact phone number, and any applicable restrictions

## When is it too windy to spray chemicals?

Follow label directions regarding wind speed and drift control agents. The chart to the left will help you estimate wind speed, although pilots have much more sophisticated tools for measuring wind speed. Pay attention to wind direction and speed. Apply when winds move spray away from water sources.

**Pesticides and fertilizers entering water can harm fish and other aquatic organisms.** Regardless of the application technique used, you are required to keep chemicals out of the water.



# Posting Signs in Aerial Spray Applications

Communication and transparency can go a long way in promoting good working relationships with your neighbors and other interested parties. Notifying neighbors will help alleviate the surprise of unexpected activity. When people are clear about what was done on a site, and when it occurred, they can feel more confident about re-entering the forest.



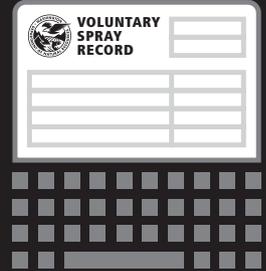
**WE STRONGLY ENCOURAGE YOU TO NOTIFY YOUR NEIGHBORS BEFORE AN AERIAL APPLICATION.**



## PROMOTE TRANSPARENCY

Download the 'Voluntary Spray Record' and Email it to DNR.

The spray record is a great tool for building positive relationships with people near your spray application. The information provided can help



alleviate concerns from adjacent landowners, residents, and tribes. Tribal members and others may gather food from nearby forests, and many people use neighboring lands for recreation. The record provides interested people with information about applicable laws and assures them that the pesticide label is adhered to.



1. Download the form DNR's website: [dnr.wa.gov/voluntarysprayrecord](http://dnr.wa.gov/voluntarysprayrecord).



2. Fill out the aerial spray application form.



3. Email the form to the corresponding DNR Region office (emails on back cover).

## POST SIGNS BEFORE AERIAL SPRAY APPLICATIONS

- 1 Make signs that include the product name, date of treatment, a contact phone number, and any applicable restrictions.
- 2 Five days prior to spraying, post the signs at all places where people might enter the treated area.
- 3 Leave signs posted at least 15 days after application.



### POST SIGNS AT POINTS OF ENTRY:

- ▶ Trailheads
- ▶ Forest Road or public road adjacent to unit
- ▶ Public Access Points
- ▶ Gates



### DOWNLOAD A SIGN TEMPLATE

DNR Forest Practices has created a sign template that contains all required information as well as recommended information. This 11" x 17" PDF template (in black & white, and color versions) can be found at DNR's Forest Practices web page: [dnr.wa.gov/forest-chemical-applications](http://dnr.wa.gov/forest-chemical-applications)

### Best practices signs should contain:

- ▶ **Name of the product used**
- ▶ **Date of treatment**
- ▶ **Applicable restrictions**
- ▶ **Contact telephone**
- ▶ Emergency contact
- ▶ Other relevant

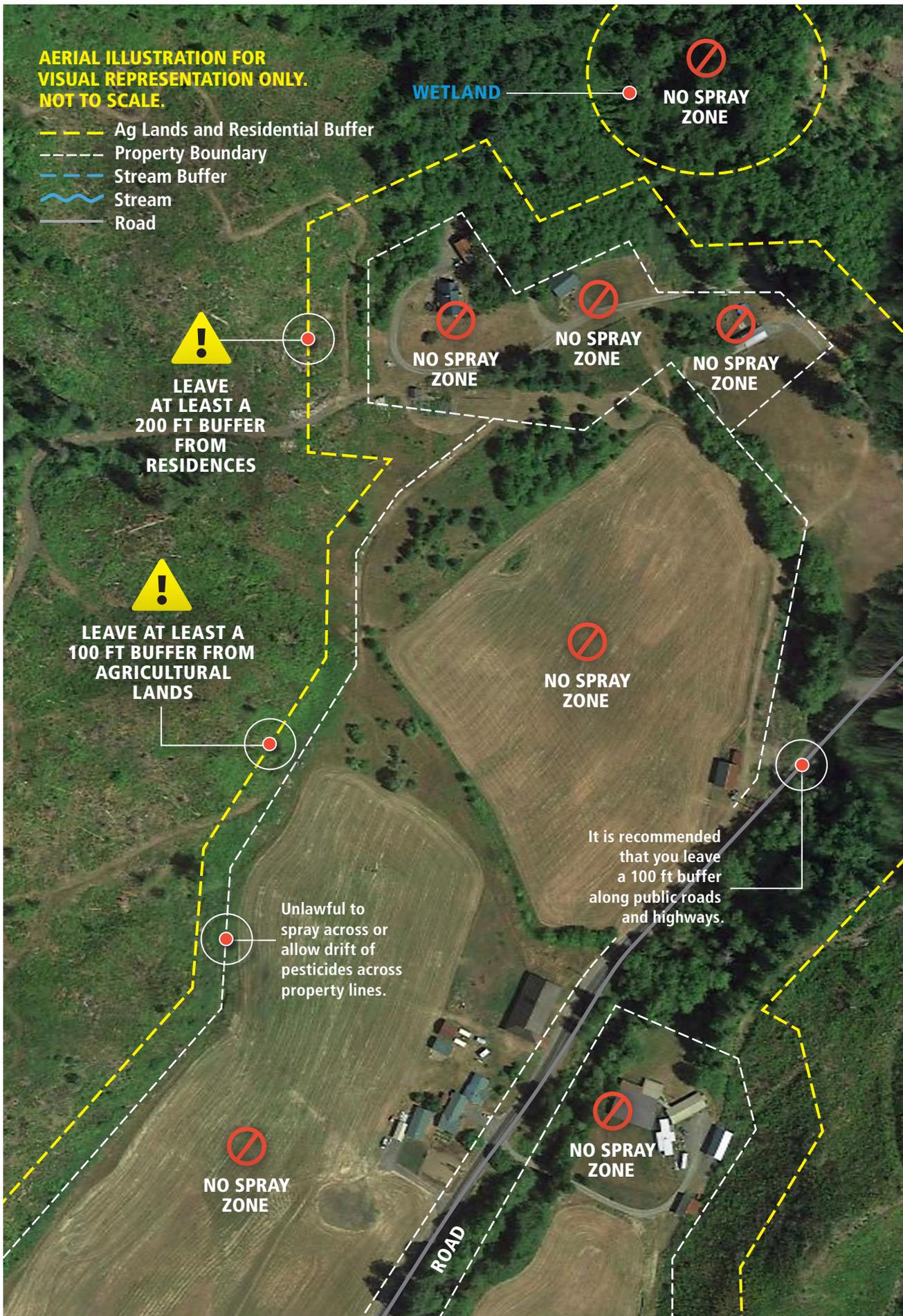
Bolded items are required by Forest Practices Rules to be on the sign.

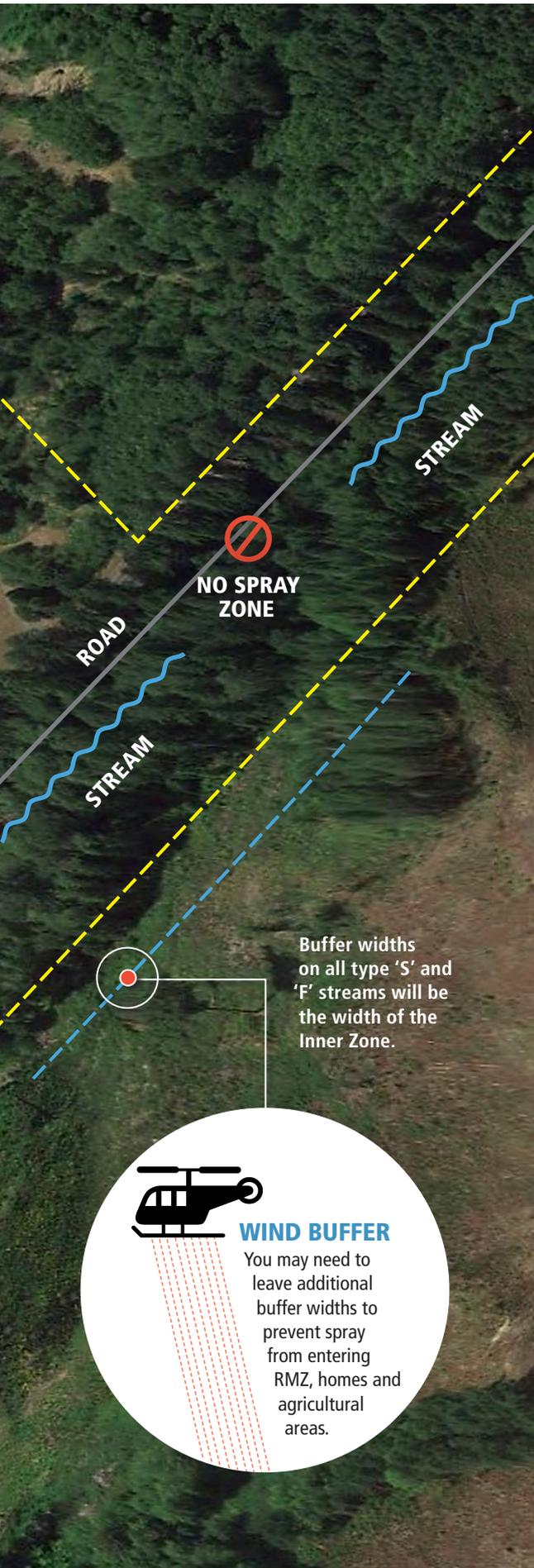
 <b>NOTICE OF CHEMICAL APPLICATION</b>	
BRAND NAME OF CHEMICAL / ACTIVE INGREDIENT	
BRAND NAME OF CHEMICAL / ACTIVE INGREDIENT	
BRAND NAME OF CHEMICAL / ACTIVE INGREDIENT	
DATE OF APPLICATION	DATE RE-ENTRY ALLOWED
APPLICABLE RESTRICTIONS	
EMERGENCY CONTACT INFORMATION	
CONTACT PHONE	
FOR EMERGENCIES, CALL 911	



**AERIAL ILLUSTRATION FOR VISUAL REPRESENTATION ONLY. NOT TO SCALE.**

- Ag Lands and Residential Buffer
- - - Property Boundary
- - - Stream Buffer
- ~ ~ ~ Stream
- Road





Buffer widths on all type 'S' and 'F' streams will be the width of the Inner Zone.

**WIND BUFFER**

You may need to leave additional buffer widths to prevent spray from entering RMZ, homes and agricultural areas.



# Buffer Zone Requirements for Chemical Applications

## HAND APPLICATION

► Hand applications do not require a buffer. However, they must be applied to specific targets, and chemicals must be prevented from entering water. No pesticides may be applied by hand within the core zone, channel migration zone of Type S and F Waters unless necessary to meet requirements for noxious weed control.



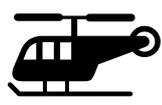
## MOTORIZED GROUND APPLICATION

► Leave at least a 25 ft buffer along Type A and Type B Wetlands and on all sides of Type N streams when water is present or flowing.



## AERIAL APPLICATION

- Buffer widths depend on the width of the inner zone on Type S or F streams
- Buffer widths depend on the width of the Wetland Management Zone
- Spray cannot enter any surface waters
- Offsets from these buffer widths depend on the height the aircraft is flying, the nozzle type, and the wind direction
- At least 200 ft from homes and residences
- At least 100 ft from agricultural lands



# How to Report a Spill

**Immediately report spills of oil or other hazardous materials.**

## WHO TO CALL

**National Response Center**

**1-800-424-8802**

## AND

**Washington Emergency Management Division**

**1-800-258-5990 or**

**1-800-OILS-911**

## WASHINGTON DEPT. OF AGRICULTURE (WSDA) RESTRICTIONS

- ▶ All pesticides used in Washington State must be registered.
- ▶ Applicators must have a license for use of some pesticides.

To ensure if pesticides are registered, check Washington State University Pesticide Information Center (PICOL). PICOL is a database found at: <https://picol.cahnr.wsu.edu/>, and WSDA: <https://agr.wa.gov/departments/pesticides-and-fertilizers>.

### Complaints

Report label violations (using an unregistered chemical or using a chemical contrary to its label) to WSDA: 360-902-2040

### Chemical Drift

Report chemical drift on forest land to WSDA: 360-902-2040

## DEPARTMENT OF NATURAL RESOURCES (DNR) RESTRICTIONS

Forest Practices Rules require buffers when applying chemicals near streams and wetlands in the forest.



# Suggestions for Success

The following list has suggestions to help you achieve management objectives while protecting long-term investments and public resources. These suggestions may exceed Forest Practices Rules.

- I have read the "Chemical Maintenance" section.
- Read and follow directions on all forest chemical labels.
- Contact a forestry consultant/applicator for advice on:
  - ▶ Whether you need to use chemicals.
  - ▶ Alternatives (chemical and non-chemical techniques).
  - ▶ Choosing the right chemical for the desired results.
  - ▶ Using the right amount of chemicals, at the right time, in the right places.
  - ▶ Using the appropriate application technique.
- Check with DNR to see if you need an FPA/N for the activity you are proposing.
- Keep a distance of at least 25 feet from open water to prevent chemicals from entering any typed stream or wetland during mixing, loading, and application.** 
- Develop an emergency plan for accidental spills.
- For aerial application, keep records of:
  - ▶ Who applied the chemicals.
  - ▶ When, where, and which chemicals were used.
  - ▶ How much was used (rate of application).
  - ▶ Weather conditions.
- Make sure people hired to apply chemicals have proper licenses (contact Washington Department of Agriculture).
- For aerial applications, post signs per forest practices rules and notify adjacent landowners.

- Plan chemical applications for the right time and season for resource protection.
- Use protective equipment and gear appropriate to the application, as specified on the label. 
- Make sure applicator knows the location of:**
  - ▶ Ground and aerial application of pesticide or fertilizer buffers
  - ▶ Core and inner zones of RMZs (same as harvest core and inner zones).
  - ▶ Channel migration zones.
  - ▶ Sensitive sites.
  - ▶ Type A and B wetlands and their wetland management zones.
  - ▶ Streams.
  - ▶ Lands used for agriculture, houses/residences.
  - ▶ Water intakes (hatcheries and public water systems).
  - ▶ Heliports, loading and mixing areas.
  - ▶ Powerlines.
  - ▶ Roads and trails entering or adjacent to the spray area.
- Remove containers from the site and dispose of properly.
  - As a landowner, attend Department of Agriculture's pesticide applicator training courses to better inform yourself about pesticide application.

